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Economic Possibilities of Electrical Farm Development

Improved Methods of Agricultural Production and Rural Life as Desirable as in Other Industries, and of Equal Concern to All People—Situation that Demands Immediate Consideration

By A. R. SAWYER

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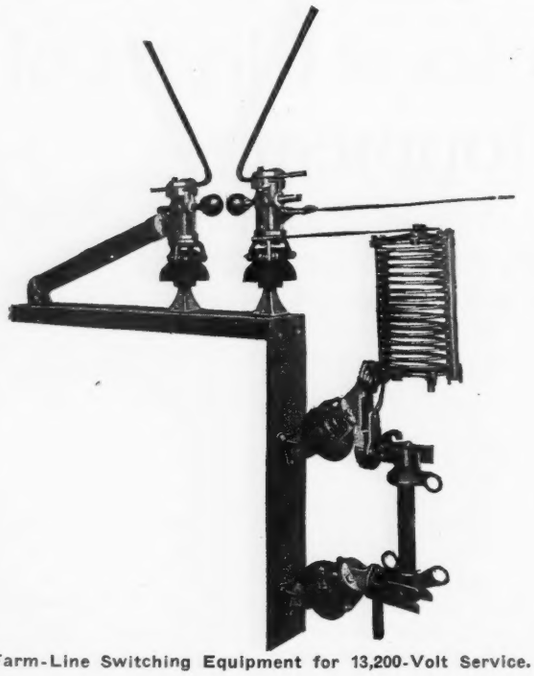
In 1896 two seniors at the Wisconsin State University undertook as a thesis to make some tests on a plant in Madison which manufactured agricultural implements, their object being to convince the management that it would be to their advantage to electrify the factory; that is, put in an electric generator and motors to drive their machines. By taking cards from the one engine which furnished the power they found that 150 hp. was used to drive the plant, and at noon, when no machines were in use, 125 hp. was used (or approximately those figures) to run the line shafting, mules, quarter-turn belts and other power transmitting machinery. They had a good argument for electrifying and advised the management to use the engine to drive a generator and to put in motors and a wiring system.

Did they make the change? It was not even considered after they were told how much the change would cost. They could not bring themselves to the point of scrapping equipment that had cost good money and making an additional investment such as would be required. But doubtless that company is either electrified today or is out of business. Such companies gradually did electrify or were put out of business by others which started up, using the newer method of drive. No doubt this story can be duplicated many times. A few years ago the writer visited a plant which manufactured electrical machinery and remarked that they seemed to use electric motors as freely as most people used jack knives, but was assured that every foreman had to show that a motor would pay for itself before permission was given to install it.

It is quite evident that the farmer will follow

Arrangement of a Portable Motor Outfit for Farm Service. General Electric Co. Application.

the development which has taken place in manufacturing methods by making similar changes in his methods. The average farmer is willing to use electricity now but is incapable of adapting the motor to his needs without assistance. How did cotton factories, hat factories, pattern makers, paper mills, coal mines and others all learn to



Farm-Line Switching Equipment for 13,200-Volt Service.

make such wonderful use of electricity in their work? The experts on whom the success of those various factories depends are not usually aware that electricity can help them until some electrical man studies the situation and shows them, and the electrical man does not know enough usually about the intimate details of the various manufacturing methods to develop electrical methods without a considerable study and sometimes a good deal of conferring before success is attained. It is well known that the central stations and manufacturers of electrical machinery maintain men to discover places where electricity can be of use.

Surface of Farm Application of Electricity as Yet Scarcely Scratched.

Although it would be a very interesting study, it is not the purpose of this article to rehearse in detail just how the use of electricity has improved the product or cheapened the cost of production in many places, but the fact that it has been done time and again leads us to feel sure that it can help the farmer in his problems. In fact, our library contains many brochures showing what has been done to aid the farmer, but it seems that the surface has just been scratched. With all that has been done, it still remains that a farmer's life is a very laborious one—his hard, horny hands give evidence of that.

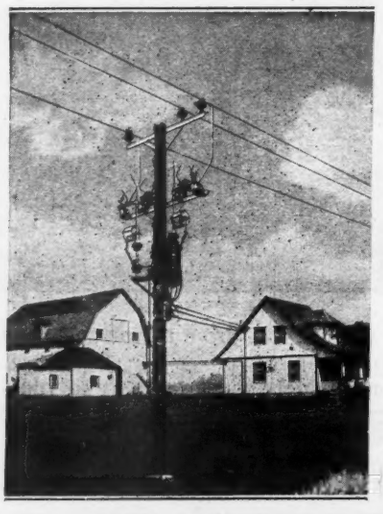
Suppose it were proposed that a successful manufacturer of cotton cloth should change his job to that of farming; he would not think of making the change if he were to become a farmer as we ordinarily think of him. The successful manufacturer occupies a well-kept office, directs the work of the various departments—even department managers have good offices, wear good clothes and direct others, doing all that is possible by machines, the rest being done by men of lesser ability. Before he attained success he may have done some of the work himself but he soon discovered that he must think and plan, letting others do the manual labor. Then he soon finds it desirable to let a machine do the work wherever possible in order to lessen the cost of production —many employes receiving a bonus for suggestions which lead to a decrease in production costs until manufacturing has now become a mad scramble to see who can most completely reduce this cost.

In every case electricity has played an important part and it is reasonable to look to electricity to help the farmer to reduce the cost of production and similarly release him from severe manual labor so that he may study better methods. The small electrical plants which many use are helping to start that acquaintance and are improving the situation, preparing for the next step when he can obtain it from the central station.

The manufacturer has found it inadvisable to make his own current, and so the farmer will find, when he can buy it. Not until he can have electric service in unlimited quantity will he begin to profit by the experience of the manufacturer and receive the benefit that will put his business upon a higher plane. That this is true, it seems to me, there are abundant results already to testify.

Development of Details in the Supply of Central Station Service to Farms.

Suppose we look a little more in detail into the matter of supplying the farm with electricity and for methods of getting benefit from it. To supply direct current, except in a small way, would be out of the question. Alternating current is the only thing that can be considered. The Benton Harbor and St. Joseph (Mich.) station put out single-phase service at first, using a single wire with ground return to supply the service transformers. After a load was developed two wires were strung, giving 3-phase, and finally three wires were put up. That was a step in getting the confidence of the farmer as well as that of the

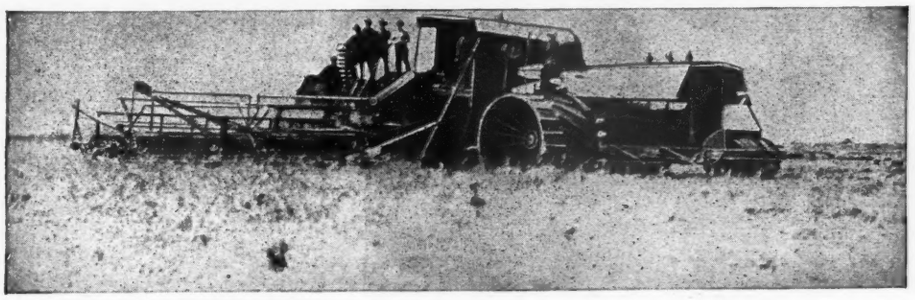


Unit-Type 13,200-110-220-Volt Farm Line Equipment of "Delta Star" Make.

central station people, but is no longer necessary, a 3-phase line being put up at first.

It is sometimes thought that central station people are not very enthusiastic about this class of customer, but they are coming to realize that they must eventually supply the farmer with electricity the same as a manufacturer in a city. In fact, another company in Michigan which supplies power over quite a large area—much of it to farmers—offers them the regular power contract. In these days of limited financing power they are asking the farmer to finance the extension but reimburse them by allowing one-half of their bills until the cost is paid back. In fact, I know of many stations that are doing the same thing. Understand, they do not agree to furnish service to any farmer who applies, but only as his location is such that, looked at from a business standpoint, it gives promise of becoming a profitable load. Moreover, this same company itself owns 25 or 30 farms, and is endeavoring to make them self-supporting, while for a limited period they are owned by the company.

These farms are supervised by managers and financed separately from the rest of the company's affairs. From a conversation with one of these supervisors I was able to get a view of the situation, and let me assure you that this manager was interested in the farming proposition and not in the central station company. He complained somewhat of the fact that the contract contained a clause which penalized the customer if his maximum demand went beyond his average load. For example, if he used a 15 or 20-hp. motor for threshing or running his ensilage cutter for a few days, his peak load went way up and he had to pay for it, therefore he considered using a gas engine for that particular work. He had used a feed grinder and, as it drew a heavy load, was threatening to get a gas engine for that also. The central station solicitor and the farm manager were trying to settle their difficulties.



Gas-Electric Harvester. General Electric Co. Application.

One of these farms is producing a high grade of milk for city use and this manager has found it expedient to employ electricity very generously. For example, in the summer such companies usually experience a decided falling off in milk production due to the irritation and annoyance of flies, so he keeps his cows in the barn all day, cooled by a battery of electric fans, and turns them out into the fields at night. He was thus able to avoid the frequently occurring slump in milk production. Of course, he uses electric lights about the barn, has a refrigerating plant, pumps water and does much work besides by means of electric motors.

From about 2:30 or 3 o'clock in the morning this farm throws quite a load onto the lines for 2 hrs. or more, and because of the lighting, fan load, refrigerating and pumping loads, its peak exceeds the average. Incidentally, this farm manager makes ice and has about decided to haul the ice he needs from town once or twice a week rather than make it—just to reduce that peak load. We see that this farm his just the same problems as those the city manufacturer has been thrashing out for a number of years. Not far from there experiments are being made on running a farm with a gasoline engine, all plowing being done by this means. In fact, the gas engine is closely associated with the electric motor in farming as in city work.

We have been training ourselves to see that the gas engine and the motor are not competitors but have been sitting down at the same banquet table for the last 20 yrs. as old pals. The gas engine has its field and the electric motor has its field so we must look for the sharp line dividing their uses, just as we have learned to do in discriminating between the gasoline motor and the electric motor; the gasoline truck and the electric truck in other places. A town which has been pumping water with an electric motor recently decided to install a gas engine as an emergency measure for fire protection. It found that the gas engine could pump water at a less expense than that incurred by pumping with an electric motor. It does not take a prophet to see that there would be a fight in that case, although it might be argued that pumping with an electric motor is more convenient than the maintenance of a gas engine.

Diversity of Application Required for Farms as for Industrial Plants.

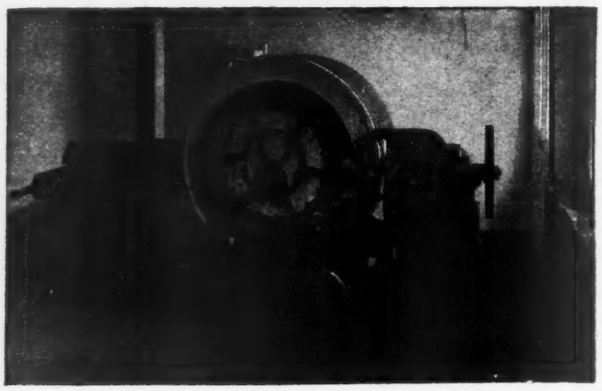
Before we go very far we will have to do better than just talk about helping the farmer use electricity. We must go into details for the dairy farmer, and then study a different problem for the man who has 1000 acres in Dakota. The farmer whose farm needs irrigating requires still other advice. In other words, they all have to be assisted independently, just as the cotton mill and paper mill call for an entirely different study.

Before the recent war we heard that Germany was using electric motors for plowing. This field has not been touched upon at all in this country. If Germany made a success of electric plowing it must have been because her fields were quite small compared with the areas that have to be plowed in this country. We have hardly begun to attack the problem of transportation of heavy loads on the farm by other methods than those of animal effort, such as the horse-drawn

wagon, the man-pushed wheelbarrow and the shoulder-carried bushel bag. These should all be replaced by machines, such as the electric truck, the elevator and the conveyor. The electric truck may prove its superiority over the gasoline truck for short hauls and frequent stops on the farm, as it has in the city. We may have to resort to the caterpillar type of propulsion for soft or marshy ground. Many of these problems may be solved as soon as the farmer is supplied with electricity and the electrical man has time to work out solutions for him.

We have, in fact, been prone to compare the farmer with the manufacturer. We will help ourselves considerably if we think of the farmer as a manufacturer who takes the raw material, puts it into a more refined condition, with possibly a second process before he sells the twice-refined material in the form of animal flesh, using all the byproducts of the doubly-refined product on the farm just as the packers have learned to use byproducts in their system to help profit.

Although there is some available data on the use of electricity in improving production directly; that is, using a static field to increase the rate



100-Gal. Churn Driven by 3-Hp. Motor, Direct Geared, General Electric Application.

of growth and artificial light to stimulate egg production, much remains to be done and, no doubt, economies may be effected by these media.

Economic Interests of All Demand Modern Improvements in Farm Methods.

One of our efforts must be to stimulate a better plane of living on the farm. It has been said that the farmer cannot afford to pay high wages; cannot compete with automobile factories which have been paying big wages, although they are not doing so just now. With better methods of production and counting time as a valuable ally, it is quite possible that many of our notions in that regard will be revolutionized by developing electrical methods.

In applying electricity to manufacturing, some of the problems had to be given up until a few years later when a second or third attack finally solved the problem, and doubtless repeated attacks will be necessary to raise the standard of farm life. A tumble-down house or a house kept in disorder should not be tolerated on the farm any more than in the town, and electrical aids to housekeeping should be applied on the farm as well as in the city.

Many attempts at manufacturing have been abandoned because economic conditions would not warrant the manufacture of certain articles. After a time, a change in economic conditions makes it possible to resume manufacturing that which, under the former conditions, was prohibitive. And the farmers' economic situation may be changed in order to make improvements in their methods. I have not mentioned the interdependence of the city and the country; that has been mentioned so many times that only passing reference should be necessary here. The city people need the products of the country and the country people, of course, depend upon getting many articles from the city; or, to use a new expression: The manufacturer in the city and the manufacturer in the country must help each other mutually.

SEVEN MEMBERS ADDED TO STAFF OF ARMOUR INSTITUTE.

The steady growth of the institution and the development of new phases of work in the various departments has added seven new members to the faculty of the Armour Institute of Technology, Chicago, for the year 1921-1922. They are as follows: H. J. Kesner, associate professor of civil engineering; R. J. Foster, instructor in descriptive geometry; R. T. Nelson, instructor in actuarial science; Miss Nell Steele, librarian; W. B. Amsbary, lecturer in general literature; F. C. Lusk, lecturer in business law, and W. C. Krafft, instructor in physical culture.

Armour Institute of Technology was honored at the annual meeting of the Fire Underwriters Association of the Northwest, held recently in Chicago, by the gift of a large bronze tablet in commemoration of the eminent service rendered in the cause of fire prevention by the late president, Dr. Frank W. Gunsaulus. This tablet, bearing a sculptured head of Dr. Gunsaulus and an inscription to his memory, was presented to the Institute by seven of the leading fire insurance organizations of the United States through the Fire Underwriters Association of the Northwest. The speech of presentation was made by Wellington R. Townley, a past-president of the Association, and Howard M. Raymond, acting president of the Armour Institute of Technology, made the speech of acceptance.

The interest in fire prevention shown by Dr. Gunsaulus in 1903, when a union committee on fire protection called on him, resulted in the establishment of the present department of fire protection engineering at the Institute, and laid the foundation for the only complete engineering course of its kind offered in any institution of the country. Fire insurance organizations have evidenced their interest in this work at the Institute through the co-operation of the Underwriters' Laboratories, Chicago, and the establishment of 25 scholarships awarded each year by a committee of insurance representatives for the duration of the 4-yr. course.

Not since 1880 have prices at which the thrifty may buy bonds of the public utility companies been so low. The result is that they yield to the purchaser a very high rate of interest on his investment.

Contractor-Dealer Finds Profits in Farm Plants

It Took This Man a Long Time to Reach the Rich Rural Field, But He Finally Developed a Big Trade By Loading His Lighting Plant Upon a Motor Truck and Demonstrating It for the Farmers

By L. B. ROBINSON
Consolidated Utilities Corporation, Chicago.

Getting business is today the main problem for us all. It is easy enough to take care of any orders for labor or material after they have been placed. That is just another way of reciting the old saw to the effect that "brains and ideas still beat perspiration when it comes to profits." The best man in a contractor-dealer business should and must be the owner. But he isn't always, as a dozen visits will disclose to you.

Why is it the visitor to such a store is usually greeted only by a young lady who interrupts her tatting or hoopwork long enough to tell you, "Mr. Jones is out"? If you want to buy something and there is a price tag on it she can take your money, but that is about as far as her business knowledge is apparent—except that she can write down your name so "Mr. Jones" can be told you want to talk to him.

Let's not begin right at the start to hammer the hard-working contractor-dealer. All we want is to give him enough of a jolt to get his attention so we can have an argument, and he is usually "broncho-busting" around town in a flivver, so it requires a bit more than a wave of the hand to halt him. Undoubtedly the majority of contractor-dealers are men with a liking for doing clever work with their hands, who have done wiring jobs until they have created a desire for their services on the public's part, and so they open an office or get desk room where telephone calls can converge, and a set of books as well as working material can be kept.

With an increase of business, a girl to answer calls is installed. Later a jobber salesman sees a chance here to sell some fixtures for sample display, followed by washing machines, vacuum sweepers and electric flatirons. But it is a fair bet not a dime's worth of anything ever goes from that store to a customer unless some one comes in and *asks* for it. Deny it who can.

The boss is out on the job from morning to night, working like a terrier sniffing into partitions, augur holes and cellars, doing his work honestly and squarely, coming in late at night tired and hungry and comfortably feeling that business is good. He makes *wages* only up to this point. Is he satisfied? Well, it must be admitted many of them get gray and stooped at this work and keep their bills paid up.

Nobody can preach a sermon clear and strong, definite and complete enough to be a textbook or guide to a wholly changed manner of life. No person can change his larger habits over night, and if he did we might all lose our friends. But every fellow can get a new angle now and then on a proposition he is too close to for making a proper analysis, and after he figures this out in his own way, he possibly adopts one new idea for his benefit.

Musing of One Contractor-Dealer and What Came of His Retrospection.

"Bill Smith" was a chap of about the usual style, square, industrious, married and busy with a contractor-dealer business in a town in southern Wisconsin which your finger would entirely cover on the map. Bill sat in his office chair one Saturday night with his hat pulled down to shade his eyes from the glare of the 50-watt lamp over the desk. Bill had a lot of friends—about as many as anybody in town. In fact he had been born and grew up there, being away only while he helped on a big job over in France for a couple of years, so he knew everybody. That is, he knew all the old town crowd. The past year it seemed the town was filling up a little with new faces—folks he didn't know. A few houses were being built here and there, some of the old ones were being remodeled, additions for two of the old school buildings were being talked about. A young fellow had moved in from Milwaukee and was putting up a brick garage, and a new motion picture house was going to take business away from the old familiar one.

Bill used to know most of the farmers—as his dad did—but this night Bill was tired with a hard week's work, his family was growing, and every week the grocery bills were just a few nickels more so his business, while keeping up all right, wasn't letting him figure on doing much more than break even. When Bill got tired like this we was inclined, like the rest of us, to be a mite discouraged with the future. He was no quitter but he couldn't just seem to get a grip on anything new, and the grinding demands of 10 hrs. work every day didn't leave him much time for figuring.

When Bill got up to sell a couple of lamps to one of the town lawyers going home late with this forgotten errand on his mind, he was just glad one cheerful citizen had called. They got to visiting and the lawyer put Bill under a gentle quiz on his life in the trenches which none of the boys seemed to want to talk about—much.

After the customer left Bill slumped down in the chair again and began to review the experiences just called to mind by the conversation. They were mighty clear pictures tonight and Bill could see a lot of things which had been getting dim. Well, it *had* been a tough job and was well

over. Guess he'd been there yet if they hadn't taken hold of the mess and cleaned it up shipshape. Glad to be back, you bet, and hoping to stay. Then into Bill's conscious mind an idea began to blossom slowly but steadily. He had been a buck private doing what he was told without question, sticking on post when that was his detail, or slipping out in the greasy dark through the wire and the shell holes and sometimes rushing one of the long grey line across stubble and ditches into the face of a murderous hail which would then die away to be succeeded by the snappy though broken rollcall of his company in the captured trenches.

"Bill" Decides to Remodel His Business Along Military Lines.

What struck Bill was the idea that back of what he did must have been some plan of which he was a part. He alone, nor his company or regiment, didn't win the war. They were the fingers of a hand of an arm belonging to a brain that stood away back in the quiet behind the lines where information was collected, plans made and instructions issued. His daily job was one of thousands just like it, and if he dropped out the vacancy was filled almost before Bill realized he was through, because the planning had to be carried out just the same. Bill knew, as we all do, that sticking in one place and holding one trench didn't win. The boys had to keep going ahead and on until defeats and hardships and losses at last were convincing enough to "Jerry" to make him quit. Then Bill could trail his rifle, take off his tin hat, call it a day and get home—which he did with the sergeant's stripes on his sleeves.

So this idea kept growing in Bill's mind until he suddenly straightened up in the squeaky chair, brought his fist down with a crash, and announced to the assembled wire, knobs and show case: "I've gone back to a private soldier; slumped, quit, been taking orders, doing my detail. From now on I'm going the other way; get a captaincy, be a major—no limit to where I'll get when I start promoting myself out of the ranks. Me for making some plans and giving orders myself for a change."

Now don't think Bill became a full-fledged officer at 7 o'clock on Monday morning. He just looked in that direction. But he did gamble far enough to call up Bud Hale and tell him to come over and get a job for at least a week. Bud turned up promptly, got the blue prints and "dope" on the Warren job and went whistling up there to complete it as any good wireman should. Bill began to scout around town, saw a lot of men he used to have time to talk with, learned of a new house the lumber yard had been asked to figure on and laid his lines to get the entire wiring job, fixtures and installation on a "cost plus" basis. This contract he landed later, especially because he took time—while Bud was pulling wires at the Warren house—to make and remake a most clever set of wiring plans instead of expecting to do it in the first hurried way that popped into his head when he unloaded his wire and tools.

Bill found that a half day on the phone resulted in disclosing four women who wanted to buy washing machines, and would "some day," but they bought from Bill that week. Flatirons and vacuum sweepers began to go out in the same way. Bud got to be foreman of a 2-man gang the next week, but Bill stuck with the new scheme of head work and soon two more men were added to the payroll. Yet, after the bills were paid on the first of the month, there was still $85.62 in the bank and the jobber's salesman had left some of his own cigars on Bill's desk when he last called. Bill had promoted himself one grade by now, and liked it.

Bill found that the trade journals of his profession were not published just to get his $3. They carried discussions by keen-minded fellows of the same problems which arose in his own work. Every new accessory appeared first in their advertising, and without risking a nickel he sold Mrs. Hoke a new dining room fixture and a desk lamp right from those pages.

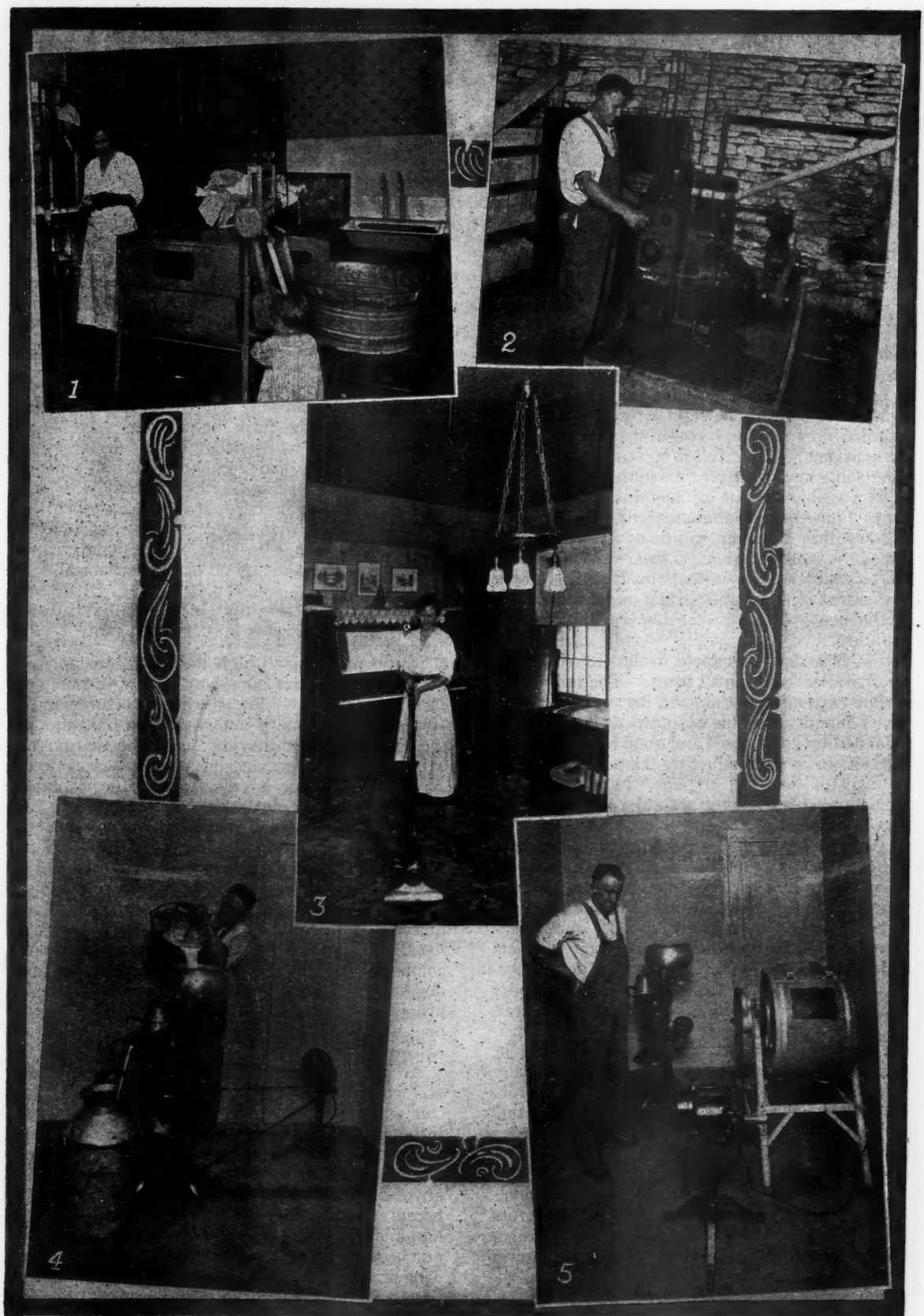
Bill began to realize that civilization hadn't reached its limit even around home. It looked as if about everybody had electricity until he came to study the facts. Then he found dozens of people who still read by the old red-glow carbon lamps—didn't know about Mazdas although Bill did, of course. Pull-chain sockets and handy wall switches, indirect lighting fixtures, labor saving devices driven by the motors to take the back breaking out of housekeeping, all tinkled a steady profit into Bill's cash box, provided he went out or telephoned or circularized for sales. Nobody, hardly, would come in asking for them because they didn't know a solitary thing about them, although they were familiar to Bill, of course.

Selling Farm Lighting Plants by Demonstration From a Motor Truck.

He borrowed a foot-candle meter from the lamp jobber and showed Mr. Miller, at the department store, why his old lighting arrangement was costly and so antiquated it couldn't properly show off the goods. That made a nice order for Bill, incidentally, but the new lights made a new store for Mr. Miller.

Talking to the farmers, Bill found they not only wanted but needed electric light and power. The young folks were leaving for surroundings brightened by electricity and where drudgery of daily labor was done away with through modern electrical devices. Bill had seen the selling of light and power plants to farmers tried several times—over the counter. Now he figured out that a plant on a motor truck, taken right to the farm where it showed the family that electricity was theirs as easily as if they lived in town, was the solution. And pretty soon Bill had a car employed at this work all the time. It opened up a field for plants, wiring, fixtures and water systems that proved a new world for Bill in which to get profits and make friends.

Bill now figures, when they go out on Sunday in the big car, that if he keeps up his present gait, and Junior comes along to take his place, Junior will just about be in business when it gets right. He can't see any end to the development of the electrical business. He discovered that by getting men to do the actual labor, he was free to plan, look ahead, use his thinking powers, create new business and become one of the solid business men of his town. Mrs. Bill is strong for the present scheme. Bill is a major, at least.



Views Taken at Shetrone Farm, Near Le Raysville, Pa.

Fig. 1.—Electricity Operates Washer and Wringer, Produces Lights and Pumps Water for the Kitchen. Fig. 2.—Western Electric Power and Light Outfit. Fig. 3.—Electric Vacuum Cleaner and Lighting Fixtures. Fig. 4.—Portable Motor Driving Cream Separator. Fig. 5.—Portable Motor Operating Churn.

SHOULD THE CONTRACTOR-DEALER SELL FARM PLANTS?

Analysis of Business Opportunities That Have Been Neglected by Thousands of Dealers in Both Small and Large Towns.

By C. E. Becker,

Sales Manager, Stearns Motor Manufacturing Co., Ludington, Mich.

Opportunity often knocks at our door without being recognized because she does not wear the garments we are accustomed to seeing her wear. The average contractor-dealer is accustomed to consider new houses as opportunities for wiring work and old customers as opportunities for appliance sales, but he has not been accustomed to think of the man who lives outside the limits of the town distribution system as an opportunity for anything. But is he right, or has he failed to recognize opportunity because she appears in a new garment? The following analysis should throw some new light on this subject.

The possible volume of any local business is always limited by the number of possible customers within a certain radius or drawing territory of the store location. The area of this business territory actually drawn from depends to a great extent on the ability of the merchant to supply the needs of all his customers in this local zone.

Now, how does this apply to the electrical contractor-dealer in the small town? The number of possible customers in the town itself is practically a fixed quantity and this business, while it may be stimulated by good goods and good business methods, is bound to be limited by the actual needs of the town for electrical supplies. In addition, it is often divided up among several competing contractors or dealers. Again, a large proportion of the available business consists of actual labor sold to the householder or business man and taking into consideration the high overhead expenses in proportion to the gross business the real profit on the labor so sold is bound to be very small.

In almost any business the percentage of overhead expense rises or falls in almost exact proportion to the volume of business done. That is, if it costs the contractor $250 per mo. for heat, light, rent, clerk hire, etc., when he does a business of $1000 per mo., the overhead would be 25% of the gross business. Now, if this dealer could do $2000 gross business the overhead probably would not increase to more than $300 and the actual overhead would be 15%. Assuming for the purposes of argument these figures to be correct, the dealer would save $100 on the first $1000 worth of business in the overhead alone. On the second $1000 gross business the profit would naturally be determined by the nature of this business, the margin of profit, etc. Whatever the profit was it would be over and above the regular profit on the old plan.

Let us consider the typical small town electrical contractor-dealer. He probably has a store and a small workshop and depends to a great extent on his own labor as an electrician for a livelihood. At certain seasons he is rushed and at others he has nothing to do. If, with practically the same expenses, he could sell a greater amount of goods at a good profit and at the same time widen his circle of customers he would not only stabilize his income, but his income tax would be a great deal larger. That is just what the agency for the right kind of a farm light plant will do for the contractor-dealer if it is handled in a proper manner.

You may have heard some dealer say, "Bill Jones had the agency for the 'Never-Give-Any-Trouble' plant and after fooling around for a year or two gave it up." Probably this was precisely the case—plenty of men have "fooled around" with automobiles and failed, and plenty of men have "tried" to sell them and failed, but that did not prove that practical automobiles could not be built. Neither did it prove that with the right business methods and the right man money could not be made selling automobiles.

There have been some farm light plants made that were mechanically unfit, but most of the failures in selling farm light plants have been caused by lack of knowledge by the dealer, first, in respect to the plant mechanically, and second, by not using business selling methods which would make it profitable. It is just as much the farm light plant manufacturers' duty to educate the dealer how to sell plants properly and profitably as it is to make a good plant mechanically.

Points the Contractor-Dealer Should Consider in Selecting the Plant.

If the price is too high the sales resistance is great, and sales are bound to be few in number. If the price is too low the manufacturer must skimp on the quality and workmanship, and in the effort to meet the low price the margin of safety in parts and wearing ability is sacrificed. A reasonable price is safest and most profitable all around for the dealer, and in the end will result to the satisfaction of the customer.

There are a certain proportion of installations which require an extra supply of energy, and a large plant is more satisfactory. There are also some places where a small plant is all that is required. However, in the small plant there is usually a small price and the manufacturer is compelled to limit the production cost to the last degree. The dealer has to go through the same process in selling the small plant as with a larger one, and the profit obtainable on the former is, of course, much less.

An average farm home will not use more than 200 watts for 4 hrs. per day the year round. Of course, at times this may run to 750 watts, or a little more, depending on what machines are being driven and the number of lights in actual use. The electrical man has a decided advantage over anyone else in selling farm light plants, not only because the members of his community look to him and depend on him as an electrical authority, but because the electrical man knows there is no danger in operating a farm light plant. Being posted on the electrical part of the plant, there is no mystery to him and it does not scare him.

Boiled down, it means an electrical dealer can double his customer list and secure an entirely new market for profitable sales without in any way interfering with his present business. It will pay the electrical contractor-dealer to sell good farm lighting plants.

High-Voltage Distribution Lines for Rural Service

Entire Farm Population, Comprising 6,500,000 Families, Must Be Provided with Electric Service—Line and Transformer Losses Reduced as a Result of Study of Detailed Service Conditions

By E. L. FISCHER

General Manager, Muscatine Lighting Co., Muscatine, Ia.

The Iowa Chamber of Commerce tells us that 70% of the total wealth produced each year in the United States is from farms. They are very anxious for the promotion of general prosperity to bring the farmer and the city business man into closer relations with each other, and are expending a large amount of time, energy and money to this end. This certainly is a worthy goal, and there is no doubt but what their cause would be greatly aided by the supplying of electric energy to farmers from the existing city plants.

Edward N. Hurley in his paper before the United States Chamber of Commerce entitled, "Arrested Development of Public Utilities," says: "It is not merely in the cities, but on the farms that more progress must be made. There are 6,500,000 families living on farms in this country. The lives of 2,000,000 of these families have been made less burdensome by the introduction of electricity, but the conveniences must still be extended to the vast majority which still remains unserved." This statement by Mr. Hurley discloses at once the surprising fact that almost a third of the farm homes are already supplied, and, further, that in his opinion at least the entire 6,500,000 must eventually be supplied.

Little more need be said concerning the demand for farm service. A recent pamphlet issued by a farm journal shows a decided demand for and expectation of electric service from high-tension lines in spite of the fact that it was designed for the purpose of pushing the sale of individual plants. There is, without question, a very great demand for the service, and it only remains to work out a basis on which it can be accepted with profit and proper protection to the company supplying the service. Some fair and constructive legislation on this subject would certainly be a long step toward total electrification of farm territory.

A serious problem of an engineering nature presents itself, and it is this problem which will

TABLE NO. 1.—DATA RELATIVE TO OPERATION OF SIX DIFFERENT FARM LINES.

Line No.	1	2	3	4	5	6
Kw-hrs. delivered through master meter	4955	2800	800	1000	4089	635
Kw-hrs. measured by consumers' meters	3258	1808	434	465	3046	456
Kw-hrs. losses	1697	992	446	535	1043	179
Percent losses	34.25	35.42	50.68	53.50	25.51	28.19
Demand in kw.	*37.50	.....	**	6.50	20.00	**
Line voltage	4400	4400	**	2200	2200	2200
Length of line in mi.	11	27	.....	10	22	1.50
Total number of consumers	122	81	24	24	132	5
Number of small-town consumers	95	32	0	0	75	0
Number of farmer consumers	27	49	24	24	57	†5
Percent farmer consumers	22.10	60.50	100	100	43.20	100
Total number consumers per mi.	11.10	3.33	.....	2.40	6	3.33
Total capacity of transformers, kv-a.	130	63	24	41	83	11
Av. kv-a connected per consumer	1.065	0.985	1	1.71	0.63	2.50
Av. kv-a. connected per small-town consumer	0.395	0.333	.....	.....	0.28	.....
Av. kv-a. connected per farmer consumer	3.46	1.06	1	1.71	1.08	2.50
Monthly sale in kw-hrs. per kv-a. of connected transformer capacity	25	28.70	19.37	11.35	35.66	41.50
Monthly sales in kw-hrs. per small town consumer	21	15.90	.....	.....	.....	.....
Monthly sales in kw-hrs. per farmer consumer	46	26.70	18.10	13.40	.....	91.4
Percent sales to farmer consumers	38	72.4	100	100	.....	100

*Both lines, No. 1 and No. 2, are supplied by one 37.5 kv-a. transformer.

†One large consumer on this line takes much more energy than the ordinary farm.

**No data available.

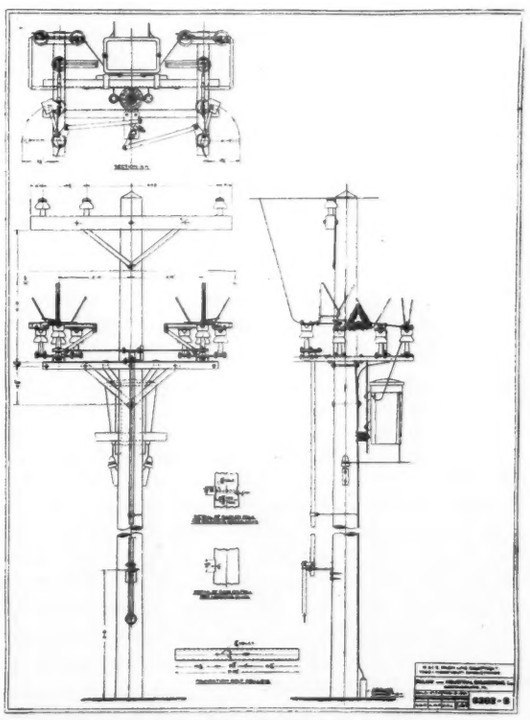


Illustration of Typical Transformer and Switching Installation.

be discussed in this article. This problem has to do with the excessive losses that most of us seem to have accepted as inevitable. The writer believes that with the help of the electrical manufacturers and the careful and conscientious development of the farmer as a potential customer these losses can be brought to a figure not greatly in excess of those encountered in our regular city distribution. More or less complete data is presented herewith on six so-called farm lines, five of which are in Iowa and one in Illinois. These lines are referred to by number as designated on the table.

Line No. 1 is 11 mi. in length and feeds two small towns, one on each end. It is fed at its approximate center. One town has a total of 65 consumers of light and power service. The other town has a total of 30 consumers. Along the line there are a total of 27 farm consumers. The total transformer capacity for the two towns is 35.5 kv-a. The transformers for farm consumers range in size from 3 to 7.5 kv-a. and make a total of 93.5 kv-a. Most of these farm consumers have two meters, one for light and one for power. This line was constructed primarily for the purpose of supplying the towns and very little if any thought was given to the supplying of farmers. These farm consumers were added to the line later as they applied for the privilege, and at that time it was the policy to connect nothing smaller than a 3-kv-a. transformer with the idea of making each

TABLE SHOWING PERFORMANCE OF TRANSFORMERS OPERATED AT 50% RATED VOLTAGE.

Capacity required in kv-a.	Core loss of this size operated in normal manner in watts.	Size required for operating on ½ rated voltage, in kv-a.	Resulting core loss in watts.	Saving in core loss, watts.	Saving in core loss, per mo. in kw-hrs.
1.0	27	2	9.3	17.7	12.74
1.5	29	3	12.3	16.7	12.02
2.0	31	3	12.3	18.7	13.46
3.0	41	5	15.0	26.0	18.12
5.0	50	10	25.5	24.5	17.64
7.5	69	15	38.1	30.9	22.25

farmer a profitable power consumer. This did not materialize, however, as it was found that the load-factor on practically all of the uses to which the farmer applies the larger sized motors was very low and that the power consumption on some 3 and 5-hp. motors was actually much less than the lighting consumption of the same consumer. The net result to the line was a very greatly increased loss.

Line Losses Reduced by Giving Attention to Transformers.

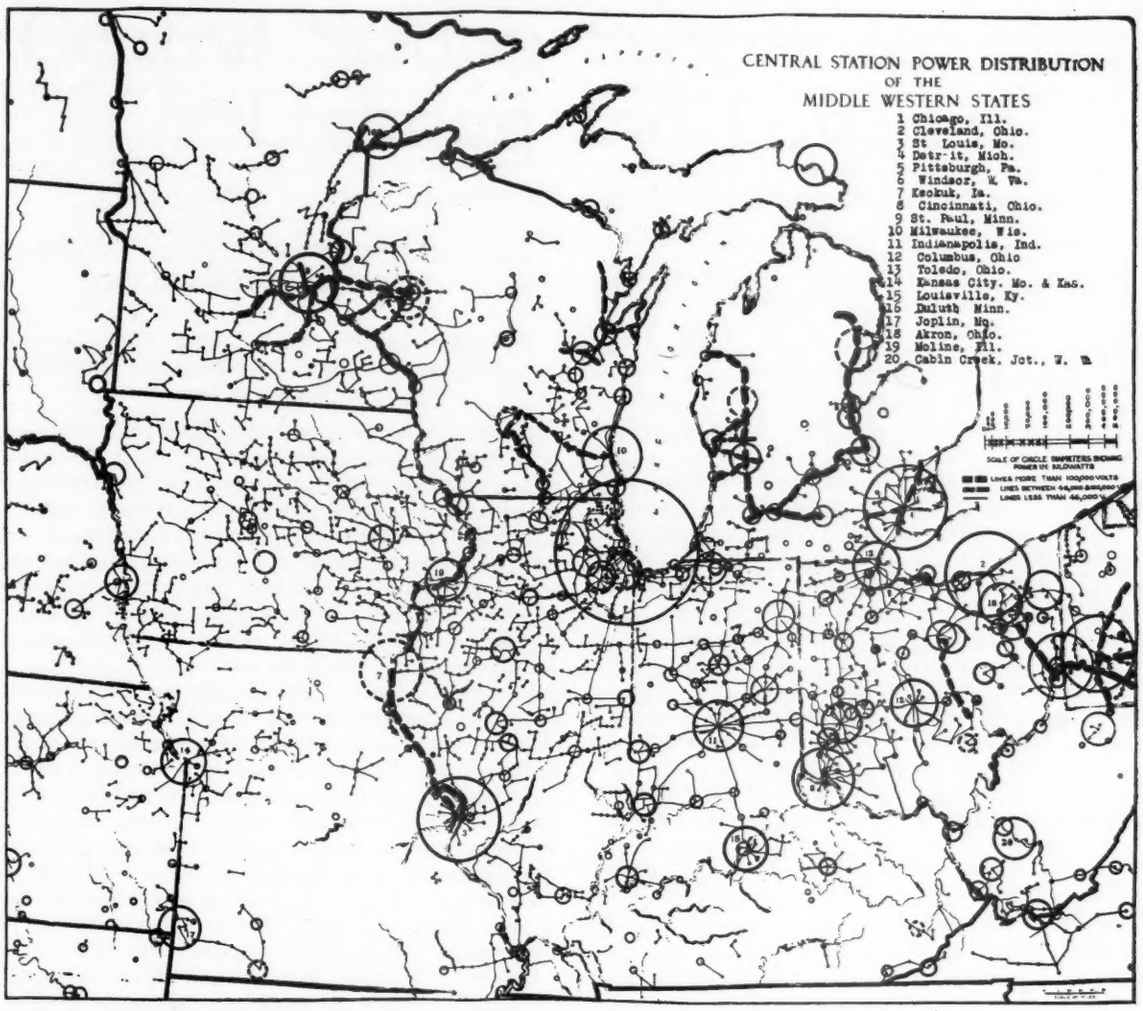
Line No. 2 is fed from the same point and from the same transformer as line No. 1. This transformer, by the way, has a rated capacity of only 37.5 kv-a. as may be noted from the table. The line is 27 mi. in length and supplies one town, having 32 consumers, and 49 farms. The greatest distance from the feed point is approximately 20 mi., the town being 13 mi. from the feed point. The town, including a 5-hp. motor, is supplied by one 5-kv-a. transformer.

When this line was planned the necessity of keeping down the transformer core losses to a minimum was constantly kept in mind. With that idea in mind the use of a 1-kv-a. transformer for light and power up to 1.5 hp., a 1.5-kv-a. transformer for light and power up to 2 hp., a 2-kv-a. transformer for light and power to 3 hp., and a 3-kv-a. transformer for light and power up to 5 hp. was recommended. A block rate is used and only one meter supplied for both light and power. The result of the policy is brought out very clearly in the accompanying table which shows that the losses on this line which serves 60% farmer consumers is practically the same as the loss on the No. 1 line which serves only 22% farmer consumers.

More or less detail has been presented concerning lines No. 1 and No. 2 for the purpose of bringing out more clearly the marked contrast between these two, being built as they were in one case with the idea of over transforming to allow development and encourage the use of larger power motors, and in the other with the idea of making every kv-a. of capacity pay for the toll it extracts from the line in core loss. The other lines will not be enlarged on in detail, but much may be learned from a careful study of the table.

The data from these lines as indicated in the table seems to prove the following: First, that the total losses on a line bear a definite relation to the ratio between the kilowatt-hour sales and the transformer capacity connected to the line; in other words, to the load-factor. It will be noted by studying the data that the lines having the largest sales per kv-a. of transformers connected are the ones which have the smallest losses. Second, that the total length of line and the number of customers per mile of line have very little or practically no effect upon the line losses. This is probably due to the fact that the load, even at times of maximum on these lines, is very light for the size of copper used and due further to the fact that the all day losses—the iron losses of the transformers—are so much greater than the copper losses on the line that the latter are insignificant. Third, that the actual kilowatt demand on the line is only a small fraction of the capacity of the transformers connected in practically every case. This seems to imply either that transformers which we have been installing on these lines are entirely too large for the load which they supply or that there is a very great diversity-factor among this class of customers.

Bearing in mind the above facts it seems that the losses on these lines can be greatly reduced by keeping the size of the transformer to a minimum and allowing the actual connected load on the transformer to greatly exceed the capacity of the transformer itself. It is not believed that it is too much to say that a 1.5-kv-a. transformer could be made to supply a farm using lights, not to exceed 3 hp. in motors, and an electric range. This may be putting it rather high as the range manufacturers tell us that their demand is about 3 kw., but we do not believe that this demand would be on for a sufficient length of time but what the transformer could stand the 200% load which would result. In support of this statement we are presenting table No. 2 showing some loads found on transformers operating on city distribution circuits. In every case first class service was being given by these transformers under the surprising overloads. These were picked from a total of 61 tests made last fall. It would be a



Farm Line Possibilities Presented in Study of Power Distribution Territory of the Middle West as It Is Today, with Chicago as the Center of a Great Super-Power Zone.

This reproduction of a map which was used by Samuel Insull during his address before the National Electric Light Association early this year tells a magnificent story of electrical possibilities as they exist in the Middle West today. It will be noted that many of the larger power centers are already tied together with transmission lines, while there are many smaller power plants which are isolated from the larger points, but have their own little radiating lines. In the near future, as predicted by Mr. Insull, the capacities of the existing central station will be increased and their transmission lines will link together in a great power zone. When that time comes it will be possible to supply practically every farm in this huge and fertile area with electrical energy.

simple matter to caution the farmer not to attempt to use his power motor and his range at the same time. The lighting load would, we believe, at all times be practically insignificant.

The real reason, however, for keeping the size of the transformer down is in order to eliminate as far as possible the core losses. An available table of the core losses for transformers ranging in size from 1 kv-a. to 15 kv-a. of one of the standard makes shows that for a 1-kv-a. transformer the core loss is 27 watts. Now 27 watts over a period of 30 days, or 720 hrs., would represent 19.4 kw-hrs., or more than the average customer who uses electricity for light only would consume. Under these conditions may be seen that any customer having a 1-kv-a. transformer who does not use more than 19 kw-hrs. would cause a loss of at least 50%. The consumer who has a 2-kv-a. transformer has a core loss of about 31 watts, which would amount to 22.3 kw-hrs. over a period of 30 days. The consumer who has a 3-kv-a. transformer would lose approximately 30 kw-hrs. during the month, and a 5-kv-a. transformer would consume about 36 kw-hrs.

It is without question possible to design a line of transformers especially for this service in which the core losses would be greatly reduced over the average commercial transformer. This would be accomplished by greatly decreasing the magnetic density of the core and would automatically act to reduce the required magnetizing current as well as the core losses. This is also desirable because of the fact that it will decrease the line current and improve the line power-factor, all of which materially reduces the copper losses of the line. This reduction of core losses would not improve the full-load efficiency of the transformer, as it would require more copper with resulting increase in copper loss, but it would greatly improve the 24-hr. efficiency of transformers in this class of service where the load-factor is invariably extremely low. The 24-hr. efficiency of any transformer will vary from zero to full-load efficiency, depending upon the load-factor.

We must, of course, expect to pay more for this especially constructed transformer than for the standard line, as they would be considerably larger for a given capacity. The actual cost to

construct, aside from the development cost, would, we believe, be somewhere between 35 and 75% higher than the cost of the standard transformer of equal capacity.

Two examples may be cited which show in a measure the results that may be expected from following this suggested practice. First, a standard 25-cycle transformer when operated at rated voltage on a 50-cycle circuit will perform as follows: (1) Eddy-current losses will be 100% of the 25-cycle losses. (2) Hysteresis losses will be 60% of the 25-cycle value. (3) Total core losses will be approximately 70% of 25-cycle value. (4) The magnetizing current will not be greater than 40% of the 25-cycle value. (5) With the same heating a slightly increased capacity may be obtained.

Second, a standard 60-cycle transformer operated on one-half rated voltage at 60 cycles will perform as follows: (1) Eddy-current losses will be 25% of rated value. (2) Hysteresis losses will be 32% of rated value. (3) Total core losses will be approximately 30% of rated value. (4) Exciting current will not be greater than 50% of rated value. (5) The kv-a. capacity will be 50% of rated value for the same copper loss. Based on heating the capacity will be from 55% to 60% of normal, depending on the relative values of core and copper losses for the particular transformer under consideration. (6) The percent regulation will be twice as large as rated, assuming 50% as full load.

Using transformers in the manner described above, and applying the above percentages to a standard line, core-loss table as given by the manufacturers results as follows:

TABLE NO. 2.—TRANSFORMER DEMANDS TAKEN ON BASIS OF 30 MIN. PERIOD FROM TRANSFORMERS IN USE IN CITY DISTRIBUTION SYSTEM.

Rated size in kv-a.	Demand.	Load in percent of rating.
2.0	6.5	330
0.6	2.2	367
1.5	3.3	220
1.0	2.2	220
3.0	8.0	256
1.0	2.2	220
5.0	9.9	198
10.0	20.9	209
3.0	8.0	256
1.0	3.3	330
1.0	2.2	220
3.0	6.6	220
2.5	5.5	220
5.0	12.1	242
1.5	5.5	367

It appears that there are at least two obstacles to the development of rural communities electrically, viz., (1) lack of definite laws stating clearly the rights and privileges of the electric companies operating rural lines, as to ownership, rights of way, liability and rates, and (2) the unsatisfactory operation of commercial transformers when used on this class of service. But these two obstacles can both be removed.

UTILITIES MUST ACCEPT RISK OF COMPETITIVE BUSINESS.

In denying the application of the New Jersey & Pennsylvania Traction Co. for a rehearing of its case for permission to increase fare, the Board of Public Utility Commissioners of New Jersey sets forth its views as regards competitive utility operation in general, saying: "If a utility sees fit to enter into a competitive field in a sparsely populated district it must be assumed that it has considered the risk of competitive conditions. It cannot expect a small population to support two competitive utilities yielding each the same rate of fare or return on property which should be allowed if only one of them were in existence."

MOTION PICTURES THAT PROMOTE FARM SERVICE SALES.

Contractor-Dealers Might Utilize Films, Lantern Slides and Lectures Describing and Illustrating Rural Electrical Development.

Country schools, township halls and even some of the larger private homes in rural communities may be easily procured by the alert contractor-dealer who wishes to develop a rich and profitable business in selling the electrical idea to the farmers with the aid of motion picture films, illustrated lectures and lantern slides. There are also Grange halls in many farm community centers where the dealer's educational entertainment would be welcome.

Included in the lecture service furnished by the Publication Bureau of the General Electric Co., Schenectady, N. Y., are a number of features that depict the modern electrical farm in comparison to the darkness and drudgery of the old farming methods. This lecture service is maintained to give reliable information on the progress of the electrical industry by means of illustrated lectures, motion picture films and lantern slides. The lectures are typewritten and the accompanying slides are numbered and indicated in their proper location in the manuscript so that the lecturer may call for them to be shown on the screen while he is reading the lecture.

One of the lectures is entitled "Electricity on the Farm," and tells of the application of electricity to various farm activities and how it has helped the farmer to solve many of his problems. This lecture is especially valuable for Grange meetings.

"Back to the Farm" is the title of a 2-reel film that vividly portrays the revolution brought about by the application of electricity to farm work. The marked contrast between working conditions on the old type of farm and one on which all of the drudgery is banished by electric service is shown by a series of episodes actually taken on a western ranch. The various steps which precede the coming of electric service to a rural community are indicated by following up the development of a hydroelectric plant which utilizes the water power of the Feather river in California. First is seen a typical dam for holding back and rendering available the energy of the water, then the pipe line by which the water is conducted to the waterwheels in the power station, and then the huge water-driven turbines and electric generators in the interior of the power station. The film then follows the transmission lines out through the country, showing the farm connections through the transformers on the pole, the connections in and about the farm house and barn and other buildings, and finally, the operation of the various electrical appliances in use.

Central Station Service for Farm Lighting and Power

Conditions in Pennsylvania Surrounding Distribution of Electric Service for Rural Customers Reflects General Situation of the Entire Country — Farmers' Demands Become Insistent

By C. W. DRAKE*

General Engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Although a large percentage of rural customers are farmers, it is preferable from a central station standpoint to classify all customers as either urban or rural. A rural customer is considered as one located outside of the corporate limits of a city or village, or any other territory having similar character or density of population. According to 1920 statistics the state of Pennsylvania had a population of 8,720,017, of which 5,607,815 live in urban territory, that is, in towns or cities of 2500 inhabitants or over. There are 579,924 people living in incorporated boroughs of less than 2500 inhabitants, which leaves over 2,500,000 people, or nearly 30% of the entire population of the state who are strictly rural. In some parts of the state very likely many miners may come under this classification, but electric light and appliances are just as essential to them as to any others.

In the state, the census lists over 200,000 farms and indicates a rural density of 70 inhabitants per sq. mi. If those counties located in the mountains and wooded sections where there are few farms were eliminated, the results for the eastern and western slopes would probably average over 100 inhabitants per sq. mi. In the Middle West and far West where there has been much activity in rural service lines the density of population is often only a small fraction of that of Pennsylvania. The large farms of the West seldom give over three customers per mile and many give less, while with our smaller farms as many as five or ten customers per mile should not be unusual. It might be argued that the power required by the large farms would make them much more attractive but records from various sections show that over 95% of the farms in the Middle West are served with transformers of 3 kv-a. or under. In fact, the recent report of the Wisconsin Electrical Association shows an average of 2 kv-a. for 161 customers and only 2.6 customers per mi. Consequently, I believe an analysis of our conditions will show an equal or greater kilowatt load per mile of line than most of the western lines.

When the subject of farm electrification first came to the attention of the central station engineers they very naturally attempted to apply electric power to every machine which required power, regardless of how often or for how long it might be used. Although it is entirely possible to make satisfactory motor applications for every machine on the farm experience has shown that the load-factor of some machines is so low that the energy consumed does not warrant the investment which would be necessary to supply the demand.

Most engineers now agree that such work as threshing and ensilage cutting, which requires from 10 to 25 hp. for only 2 or 3 days a year can be more economically done by a tractor. This work is done in some communities by a portable electric equipment consisting of a motor and transformers, with suitable switching equipment so that it may be moved as a unit from farm to farm and connected to the transmission line. Such an outfit is quite special, and would not be considered feasible except in a farming district of considerable extent.

Feed grinding is often done by the tractor as it seldom requires more than 4 or 5 hrs. per mo., but at the same time this makes a desirable central station load if a mill is used which may be driven by a motor of 2 hp. or less. This will not increase the maximum demand or the transformer capacity required, yet will materially add to the energy consumed per month.

Farmers Now Need Electricity to Improve Conditions and Production.

We are gradually learning that the desires and needs of our friends on the farm are not materially different from those living in the cities, except in some of the special motor applications. Electric light to replace the dangerous and dim kerosene lamp and lantern is always the first factor, and closely following is the desire for a running water supply. Besides these two items most of the common household appliances, especially the washing machine, quickly demonstrate their labor-saving features, and around the barn and dairy motor-driven milking machines, cream separators, churns, grindstones, etc., make the work easier and do it better and quicker.

The gase engine-driven farm unit has done much good for the electrical industry since it has proved to thousands of people how electrical apparatus can improve conditions and reduce the burdens of farm life. These units have done the pioneer electrical work and undoubtedly always will have a place on the frontier in advance of electric transmission lines. Experience in the West has shown, however, that these units simply created a desire for the more extensive and unlimited use of electric power, and that as soon as the central station service could be obtained

*Presented at Fourteenth Annual Convention, Pennsylvania Electric Association, Bedford Springs, Pa.

there was little hesitancy in shutting down or disposing of the gas engine outfit.

A recent editorial mentions that, of the men who left the army when the war was over, less than 2% went back to the farms. If approximately 50% of our population is rural it is evident that farm life is not sufficiently attractive to these young men to take them back after once having been away. Electric power and light banish the worst drudgery of farming for both men and women and should do much to make farm life more attractive, especially for those who were once accustomed to it.

More Study of Farm Service Required by Central Stations.

So it is that at present we should really consider the farmer as coming to the central station and asking for or demanding power rather than the central station going out and soliciting it. The average farmer knows that electric service will cost him more than it would in the city and is willing to pay a fair and reasonable price, but is wholly ignorant of the problems that enter into this service. Some central station men also know little about the actual cost of this service and it is only after exhaustive study of all factors that a rate is obtained which nets a profit to the central station, which is satisfactory to the user and which also tends to increase rather than decrease the use of energy.

Probably one of the most common and readily understandable rates is that based upon the urban charge for similar service, plus an additional charge which covers the extra expense entailed for extending this service into the country. However, before the question of rates can be considered it is necessary to understand just what work is involved, how this is to be financed and executed, how the equipment is to be maintained, and last but not least, how to present this in a clear and concise contract, so that there may be no misunderstanding after the work is completed. There are probably nearly as many systems of building and financing rural lines as there are lines in existence, so that this paper will attempt only to describe what seems to be the latest practice as indicated by various utility and commission reports.

Consideration of Voltage and Phase Required for Farm Lines.

Although many 2300-volt lines are in use and giving satisfactory service, it is generally felt that this voltage is not high enough for extensive development and that new construction work should provide for either 4000 or 6900 volts, and in some cases for even 13,800 volts. At present 6900 volts seems to meet the conditions in most localities and is rapidly becoming the standard for rural extensions.

The voltage and phase should not be determined solely by the demand of a single community, but should be so chosen that if a community or town several miles beyond desires service at a later date the previous construction will be suitable. Consideration should also be given to the possible interconnection with other systems which at present may appear only a remote possibility. As 3-phase power is desired in most towns for the water pumping plants and for other comparatively large applications, the pole construction should permit the installation of a 3-phase line although only two wires may be run at first.

Type of Construction of Pole Lines for Rural Service.

In order to insure continuity of service with the least maintenance it is acknowledged that the lines must be built strictly in accordance with engineering specifications and in most cases these are now supplied by the utility which will furnish the electric service. This insures the use of standard apparatus throughout the district, which decreases the number of repairs to be carried and increases the reliability of the service. Since the rural lines are often simply extensions of urban lines the same type of construction may be used, and at the present time many central stations are in a position to and prefer to construct these lines themselves, while others prefer to let contractors do it. It is generally acknowledged that the utilities cannot afford to have any capital invested in these lines, and that the entire cost of the line, except for the meters, should be borne by the farmers desiring the service. Whether a company is formed by the farmers to handle this business or whether the central station deals through a contractor or directly with the individual farmers, is a matter to be settled locally as is also the arrangement for adding customers to the line after it is completed.

The bare cost of these lines will vary with the voltage and type of construction used, also with the contour of the country, but averages from $700 to $1000 per mi., not including engineering or overhead expenses. Numerous quotations less than this are often seen, but it is usually found that these either cover inferior materials or workmanship or may omit many items, such as clearing, right of way, crossings, etc. Specifications issued by various commissions recommend the use of not less than 25-ft. poles of white cedar, 6 in. at the top, and crossarms of Washington fir, with locust pins. No. 6 bare copper wire or larger should be used, stranded where crossing railroads or main telephone lines. Utilities should be careful in estimating the construction cost of these lines so that it will not be necessary to make additional collections after the construction work is completed. Although 25-ft. poles are the shortest allowed most companies prefer 30-ft. poles and find that with the longer span that is permissible with the higher pole there is very little difference in the cost of the line.

Methods of Distributing Electricity Economically to Rural Consumers.

There are three methods of distributing power to rural customers from high-tension lines; first, by a distribution line paralleling the transmission line for its entire length; second, by individual transformers for each customer or group of customers, and third, by a combination of these two methods with distribution lines running each way from the various step-down points. From an operating standpoint and for continuity of service the distribution line parallel to the high-tension line for its entire distance is the best. However, this method is usually the most ex-

pensive, especially if the customers are widely scattered.

The second method, using direct transformation for each customer, causes a very high cost for transformers and this increases with the voltage of the transmission line. Besides this, every tap on a high-tension line makes a possible source of trouble. Theoretically there is no limit to the ratio of transformation which can be safely and satisfactorily used. However, from a commercial standpoint the cost of small transformers for high voltage makes them impracticable for general service, and such transformations as from 22,000 or 33,000 volts to 230 or 115 volts is justified only in exceptional cases. Even in the case of 13,800 volts, if there are a number of customers to be served not too widely scattered it may be found economical to step down and distribute at 2300 volts instead of tapping the 13,800-volt line for each customer.

In making a comparison of the two systems, it is necessary to consider not only the cost of the pole line itself, but also the cost of the transformers and the lightning protective apparatus. The smallest commercial transformer for 13,800 volts is 2.5 kv-a., which costs more than three times as much as the 1.5-kv-a., and two times as much as the 3-kv-a. transformer for 2300 volts. The 13,800-volt transformer costs about 75% more than the 1.5-kv-a. and 40% more than the 3-kv-a. transformer for 6900 volts.

Discussion of Lightning Protection for Rural Lines.

Line protection is a much debated question and, due to different climatic conditions in various parts of the country, some companies are able to give service with a much smaller and cheaper protective equipment than others. Lightning protection is somewhat like life insurance; that is, a limited protection can be obtained for a small amount of money but more protection can be obtained by paying more. The overhead ground wire used by many companies makes a very flexible arrangement with 3-phase, 4-wire, 4000-volt systems since, for the single phase taps, the ground wire and one line are used, giving 2300-volt service. This neutral wire for best protection should be grounded at each pole and this is usually done by running the wire down the pole before setting and fastening it either in spiral or zigzag across the butt. Each transformer installation should be equipped with lightning arresters and fuses and separate ground wires should be installed for the transformer and for the lightning arrester.

For this service a special farm line switch has been developed which combines a horn gap arrester with series resistance, easily replaceable fuses of the expulsion type and a disconnect switch. This unit is arranged to be operated from the base of the pole and may be locked either in the open or closed position. The transformers and fuses are readily disconnected from the line in case it is necessary to replace fuses or make repairs. This type of switch is also very desirable for use with small transformer substations and is recommended for all farm service. In case of small farm transformer installations the cost of this combination switch is sometimes too great a proportion of the total installation, in which case separate lightning arresters and fuses are mounted on the pole and the disconnect switches are omitted.

The type of arrester will depend upon the line voltage, but on voltages below 6900 volts the horn gap arrester is not recommended since it does not give as complete or reliable protection to the transformers and other apparatus. For 2300-volt lines arresters of the multiple gap type with series resistance or other similar types give better protection. One of the most serious problems with such an installation is the replacement of fuses after a heavy storm, and it is usually necessary to arrange with local contractors for this work or arrange the fuses so that they may be readily replaced by the farmers themselves. The use of the combination switch greatly simplifies this operation.

In view of the large number of small transformers installed on such lines, it is essential that the smallest permissible transformers be used, in order to reduce the line and core losses to a minimum and also to maintain as high a power-factor as possible.

Some interesting statistics collected by the Wisconsin Commission indicate an average connected lighting and flatiron load of 1.2 kw. and a power load of 1 kw. per customer. Since it is practically impossible to have all of the lights, the flatiron and the motors operating at the same time it is evident that 1.5-kv-a. transformer is suitable for the average installation, and that the 3-kv-a. size will take care of quite extensive farm work.

The report also shows that of 163,000 kw-hrs. delivered to the extensions in 1 yr., only 71,000 kw-hrs. were metered, or there was a loss of about 56%, which includes both the line and transformer losses. If the losses in ordinary urban distribution are considered as 20% then the extra losses chargeable to rural service were 36%, and the rates must take this into consideration.

It is hoped that the above discussion will show that from an engineering standpoint similar factors must be considered in building rural extensions as in building usual distribution lines, and that standard materials and types of construction should be used. There is no doubt about the extent of the possibilities and it is only a question of arranging for the financing of these lines and the formulation of proper rates before the country power lines begin to take on the appearance and extent of the rural telephone lines.

HOW TO SELECT YOUR OUTFIT FOR FARM SERVICE.

Manufacturer Offers Suggestions as to Capacity of Plant Most Suited to Meet the Various Agricultural Service Requirements.

The following suggestions and notes were supplied by the Western Electric Co., New York City, and indicate what that company believes to be the needs in size of equipment for a farm plant:

There are three types of Western Electric 110-volt power and light outfits. Type CF is standard for 24-hr. service and has a 56-cell storage battery. Type CFE is for 24-hr. service and has a 62-cell storage bat-

tery with eight counter cells to regulate brightness of lights. Type D supplies electricity only while the engine is running, and has no storage battery.

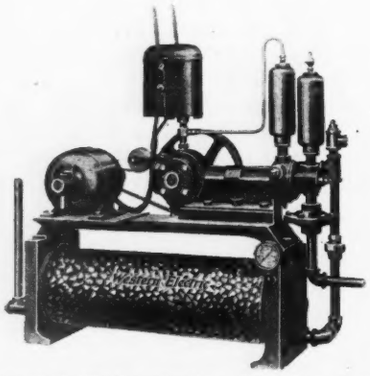
The horsepower required from the engine is the power required to run the 110-volt outfit and, if the engine does other work, the power taken for that work must be added to the figures in the accompanying table to get the total horsepower of engine necessary. The watt-hour capacity of the storage battery is the amount of electric power that can be stored in it. For example, 5500 watt-hours is the electricity to burn about twenty-two 20-watt lamps for 12 hrs. (22×20×12 = about 5500).

TABLE SHOWING SIZES OF VARIOUS ELEMENTS IN FARM PLANTS.

Type.	Size of generator in kilowatts.	Horsepower of engine.	Watt-hour capacity of storage battery, 8-hr. rate.	Watts Available for general service while charging.
30-CF-50 ...	3	7	5,500	1,400
30-CF-90 ...	3	7	9,900	500
60-CF-50 ...	6	12	5,500	4,500
60-CF-180 ..	6	12	19,800	1,000
120-CF-90 ...	12	25	9,900	9,000
120-CF-270 ..	12	25	29,700	3,000

You will notice in the table that there are three generators (3, 6 and 12 kw.) and four sizes of storage battery (50, 90, 180 and 270), and that each generator may be used with either a small or a large storage battery. To select the proper outfit it is necessary to consider both the work to be done and the conditions of service.

The engine and generator should always be run during the time when the most electricity is needed for light and power (which may be 8 or 10 hrs. per day), since it is not economical to use a storage battery any more than the service requires. The storage battery must take care of the load when the engine is shut down, which may be 14 or 16 hrs. per day, by giving



Motor-Operated Water System for Use With Local Plant.

back the electricity stored in it while the generator runs. To charge the storage battery it must be connected to the generator for about 8 hrs. During this time the generator can supply the balance of its capacity for the general service. In operation the storage battery is first charged, then used until nearly run down and then charged again.

Be sure to get an outfit big enough. After you have counted up the lights you want by going over the house from cellar to attic, and have added enough for the barn, outhouses, porch, yard, driveway, and also for the motors for the machines you want to run (for which 1.25 kw. of generator capacity per 1 hp. of motor will be required), then get an outfit with capacity to supply one and one-half times the amount you have figured. You will grow and you need a margin for emergencies.

Outfit 30-*CF*-50.—The 3-kw. outfit (3000 watts) is the smallest size generator with the smallest battery. It will run all the electrical household appliances and do most of the chores now done by hand. This outfit will light seventy 20-watt lamps at the same time that it is charging the batteries.

Outfit 30-*CF*-90.—This outfit is the same as outfit 30-CF-50 except it has a larger storage battery and will be able to carry a larger load during the time the generator is not running. This outfit is suitable for small hotels.

Outfit 60-*CF*-50.—This 6-kw. outfit (6000 watts) has a generator twice the size of the 30-CF-50 and is well suited to larger farms using heavier machines and more lights. It will light two hundred and twenty 20-watt lamps at the same time that it is charging the batteries.

Outfit 60-*CF*-180.—This set is the same as 60-CF-50 except it has a larger battery with nearly four times the capacity.

Outfit 120-*CF*-90.—This 12-kw. outfit (12,000 watts) is suited to larger farms where heavy machinery is to be operated and a large number of lights used. It will light four hundred and fifty 20-watt lamps at the same time that it is charging the batteries.

Outfit 120-*CF*-270.—This unit is the same as 120-CF-90 except that it has a larger storage battery of three times the capacity. It is suitable for large hotels of about 175 rooms, small towns of about 500 population, summer resorts or lighting mills and shops.

Outfit CFE.—The difference between CF and CFE outfits is in the storage battery and power board. CFE batteries have counter cells by means of which the attendant may regulate the voltage, which otherwise varies from 100 to 120 while the battery is being charged and discharged. This change in voltage will affect the brilliancy of the lights if there is no method of regulation. If you use lamps for 120 volts they will be considerably reduced in brilliancy at 100 volts, and if you use lamps for 110 volts they will be under considerable strain at 120 volts.

Outfit D.—These outfits have no storage battery, so they will only supply electricity while the engine is running. The generator is the same as for other types, but the power board is different.

AWARDING OF LIEBMAN PRIZE TO TELEPHONE ENGINEER.

The Morris Liebman prize, the cash award made each year by the Institute of Radio Engineers to that member of the Institute who is considered to have made the most important contribution to radio art during the preceding 12 mo. has been awarded to R. H. Heising, of the engineering laboratory, Western Electric Co. "for his analysis of vacuum tube action and his research work on modulation systems."

In commenting upon the award, Dr. F. B. Jewett, vice-president and chief engineer, Western Electric Co., said: "Mr. Heising has long been a member of the research department and for the last 5 or 6 yrs. has specialized almost entirely on radio telephone matters. There is no one in our engineering department who has individually contributed more to the success of our various undertakings in the radio field since 1914 than Mr. Heising and the action of the Institute of Radio Engineers is a just tribute to him."

Soon after he entered the radio research field in 1915 Mr. Heising was connected with the Montauk-Wilmington, Washington, wireless experiments and later the Paris-Arlington tests. During the war he was engaged in the development of circuits for aeroplane and submarine-chaser wireless sets. Recently his studies have been devoted to the perfection of radio systems for extending Bell telephone service to locations which cannot be reached by wire.

Sapulpa, Okla., will stage a historical pageant Nov. 11, showing the development of the city from the time the site was occupied by the Indians to the present. R. C. Coffy, manager of the Sapulpa Electric Co., is a member of the publicity committee, which will have charge of informing the citizens of Oklahoma and adjacent states of the spectacle.

High-Voltage Transformers in Farm Line Construction

Development of Electrical Central-Station Distribution to Rural Customers Made Possible Through Production of Dependable Line Equipment That Will Require Minimum of Attention

By J. E. JOHNSON
Kuhlman Electric Co., Bay City, Mich.

The farm is coming closer to the city every day, due primarily to the telephone, later augmented successively by the automobile, then the paved road, and now central station electric service. Always progressive, the farmer has ceased to be satisfied with the old order of things; has ceased to believe that, because he lives in the country, he must dispense with such comforts and conveniences as his city brother has enjoyed for years past.

The latest and one of the most necessary of these agencies of development has been electric service. No longer is it necessary to live in or near the city in order to enjoy its facilities. As the alternating current has made universal service in large cities possible, so has high voltage transmission and transformers made country service possible.

The ability to transmit high voltages came quickly, but the development of high voltage transformers in small sizes that could be put on a pole with a minimum of protective equipment has been slow, due probably to lack of persistent demand for them in the past.

Formerly 2300 volts was considered as being about the maximum for distribution lines. This low voltage made long country lines prohibitive in cost of material and construction, due chiefly to the heavy copper wire necessary. Transformers built along the lines of the standard 2300-volt equipment—but for higher voltages—were not successful since the long high voltage lines in the open were subject to disturbances of all kinds and suitable equipment for safeguarding against lightning was not available for these small units.

Farm Line Requirements Inspire Development of High Voltage Transformers.

Introduction of the isolated plants, consisting of gasoline engine, generator and storage battery, and their ready acceptance by the farmer has made it necessary for the transformer manufacturer to come to the aid of the central station by developing a line of high voltage transformers that can be connected on the line and require no more attention than does the 2300-volt class used in the city.

Such a transformer must sell for a price that, together with its protective equipment, can compete with the isolated plant in cost. This is far from difficult when every factor in comparison of costs as between the two equipments is carefully considered.

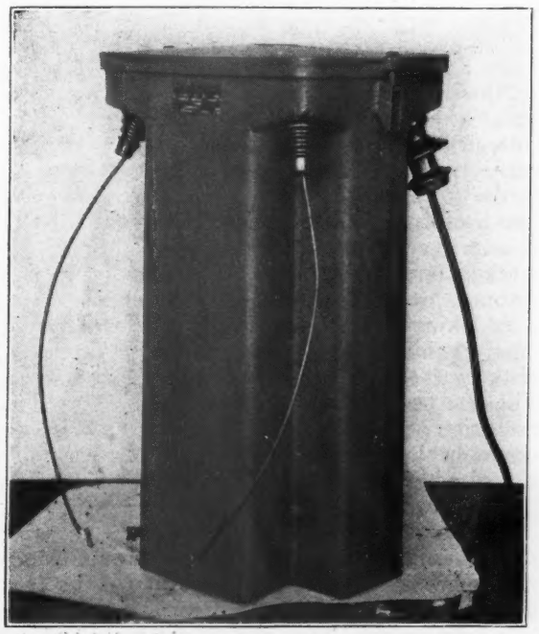
Due to their isolated situation on the line these transformers must be rugged in order to stand the rough usage they must undergo. In this connection a rather high reactance is advisable even if there is some sacrifice in regulation. Because of its present high state of development the tungsten lamp will stand quite a voltage reduction below normal rating without appreciably affecting its illuminating qualities.

Core loss should be kept at a very low figure, letting the copper loss go up in proportion, as the transformers are not in service for long periods at a time and a high all-day efficiency is desirable, together with a good efficiency at a half or three-quarter load.

Safety Factor in Construction of High Voltage Transformers.

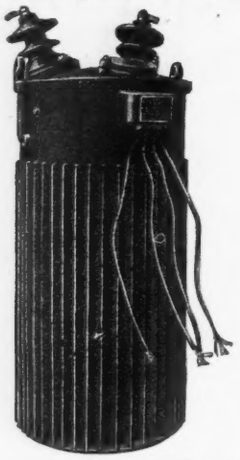
Safety is another important feature always kept in mind by the transformer manufacturer. Heavy shields of insulation are placed between the high and low voltage windings in order to prevent the high transmission voltage from getting on the secondary side, and since the cores and cases are or should be grounded there is no chance of danger from this source.

The Kuhlman Electric Co. has developed a line of high voltage transformers for farm service in sizes up to and including 7.5 kv-a. that



Single-Phase, 60-Cycle, 5-Kv-A. Transformer for 11,000 and 13,200-Volt Rural Lines.

fulfill the above conditions in detail. All the transformers for 13,800 volts and below are put in the same style of case as the standard 2300-volt class, but they have large outlet bushings coming out of side pockets. Transformers for



Type of Transformer for Service in Small Sizes on 22,000-Volt Lines.

voltages above 13,800 are put in round corrugated cases with lid outlets for the high voltage line connections. On lines up to 22,000 volts, hangers are supplied for mounting the transformers on poles, but no hangers are furnished for transformers having a primary voltage of 22,000 volts or above, it being deemed advisable to mount these transformers on platforms.

The secondaries of the transformers are wound for 115 or 230 volts, and here again the transformer installation has a decided advantage over the storage battery plant, since apparatus wound for 115 volts is much less costly than that wound for 32 volts, which is the standard for the d-c. systems.

HARNESSING THE WIND TO MAKE ELECTRICITY FOR FARM.

Mishawaka (Ind.) Concern Manufactures Power and Light Based on the Generation of Current Through the Agency of a Wind Wheel.

Now comes the Perkins Corp., Mishawaka, Ind., with a combined windmill, generator and storage battery outfit designed to transform the energy of the wind into electric energy, store it in the storage batteries and have it transformed into useful work about the farm as required. This is not a new idea, but the Perkins Corp. has worked out the details in a new and practical manner. It is known as the "Aerolectric."

A 1-kw. electric generator is mounted on the main casting at the top of the tower and geared directly to the shaft of a 14-ft. steel wind wheel. The gear bearings are Hyatt mounted. The entire reduction gearing runs in an oil bath. This generator, which is of the 32-volt type, has been designed and built by the Westinghouse Electric & Manufacturing Co. after a thorough investigation of the application. It is a compound machine, differentially wound and gives a constant voltage characteristic over a speed variation ranging from 750 to 2500 r.p.m. The armature is carried on ball bearings which are packed in grease and will operate for 1 yr. without attention.

The storage battery is of the 32-volt type with a capacity of 280 ampere-hrs. It is estimated that this is sufficient to operate the lights on an average farm for 11 successive days without recharging. The battery can be charged at wind velocities varying from 8 to 30 mi. per hr.

In a test of one of these installations at Mishawaka, Ind., during the month of December, 1920, the following results were obtained:

No. hrs.	Wind velocities, mi. per hr.	Watt-hrs. input.
155	0-5	.....
323	6-10	16,130
177	11-15	21,000
65	16-20	11,300
56	21 and over	12,000
Total watt-hrs. for mo		60,430

If the storage batteries had an efficiency of 80% this would give an average of 1495 watt-hrs. per day available for useful work. This may not

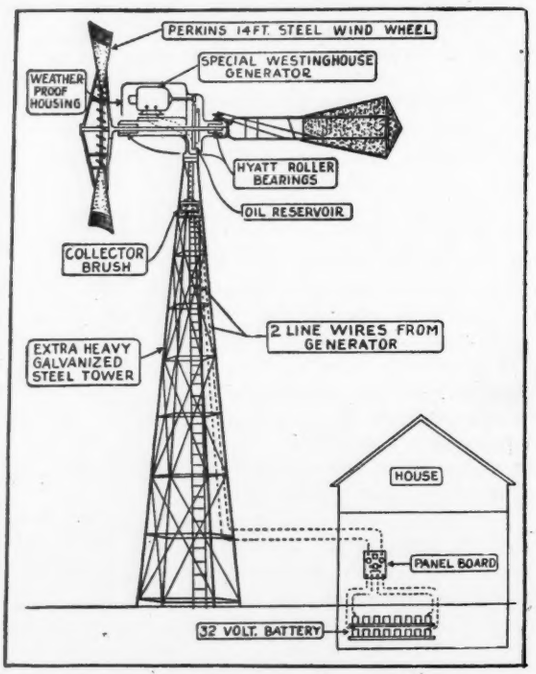


Diagram of Installation of Perkins' "Aerolectric" Generating Plant for Farm Power and Lighting.

have been an average month as regards wind, or Mishawaka may be favorably located in this respect. To get at the bottom of this matter the company has taken wind data for several states furnished by the U. S. Weather Bureau and compared it with the known performance of the "Aerolectric" and found that this outfit is capable of generating power to take care of the lighting and minor power requirements on the average farm in any part of the country.

This equipment is now being put into production and it is claimed that the price will compare favorably with that of the gas engine outfit.

No wonder electricity is temperamental. Consider its patronymics. Its watts are Scotch, its ohms are German, its volts are Italian, its farads are English and its amperes are French. The godfathers are respectively: James Watt, George Simon Ohm, Alessandro Volta, Michael Faraday and Andre Marie Ampere.

Dealers! Why Not "Cash In" on Those Magazine Approvals?

Since Manufacturers Have Gone to the Trouble to Secure Tests by Various National Publications, and Obtaining Certificates Guaranteeing the Appliances, Many Alert Dealers Will Profit

By KATHRYN MADDOCK

"The seals of approval, certifying the cleaner's quality, are second only in importance to the test of time."

To run across an advertisement plastered with the approval seals of the magazines and to read the above words from the manufacturer gives one pause.

How about it? We have generally taken the magazine laboratories pretty much for granted. Manufacturers as well as dealers have paid altogether too little attention to them. Have we not been overlooking something good?

Ask your wife. Inquire among your customers. It will surprise you to find what a high estimate they place on the "approval" of the various magazine "institutes." You may hear from them another such story as this about the housewife who had been having trouble with her canning. She put up innumerable quarts of tomatoes and then found that most of them would not stay put up because the rubbers she had been using were not first class. She perspired over it for a while, went down to the grocery to look at rubbers again and came back with a triumphant smile.

"See!" she exclaimed, "these have the *Good Housekeeping* approval. They just have to be good." She had absolute faith that the magazine passed impartial judgment on the product — and, you notice, the grocer made use of that fact in selling her the goods. Those rubbers cost a little more than the ordinary kind but, she argued, they were worth it for she had assurance that they were right. The merchant who took the pains to point out the approval to her made a telling stroke.

The idea that a publication stands behind its advertisements is an old one. People have always had the notion, apparently, that a magazine or newspaper must sponsor the advertisers. This led years ago to the stand taken by some larger papers, of eliminating all liquor and patent medicine advertising, and the next step was to guarantee all products advertised in the newspaper or magazine. This guarantee naturally made the publisher anxious to investigate the advertised articles thoroughly and the result was the establishment of the testing bureaus. The New York *Tribune, Good Housekeeping, Modern Priscilla, Delineator* and other publications maintain complete laboratories in which household devices of all kinds are given thorough tests. The articles are examined both according to scientific standards and with a view to determining their efficiency under the conditions surrounding their use in the home. The laboratories have a high reputation among readers of these publications throughout the country for making accurate and impartial tests of the manufacturer's product. The certificates of approval which they issue have considerable importance in the eyes of the housewife; whereas, she is likely to discount anything which the manufacturer has to say about his own product, she feels that a magazine like *Good Housekeeping* will give her a fair judgment. Is not its word backed up by a "money back" guarantee? She looks to the bureau as an impartial court of appeal.

Adding a "Clincher" to the Sale of an Appliance.

Have the magazine handy when you make a sale. Pick it up and show the customer "in black and white" the approval and guarantee of the appliance. No further argument should be needed to clinch the sale.

The device which wins this approval goes before the public with the prestige of the magazines behind it in addition to the good names of the manufacturer and of the dealer. The reputations of the magazines have a great deal of weight with Mrs. Housewife, and it is worth

Here's Why Your Customers Want The TORRINGTON
SEALS OF APPROVAL, certifying Torrington's quality, are second in importance only to the test of time.
—and thousands of satisfied users constantly recommend Torrington to discriminating friends seeking the satisfaction rendered by more than usual service in an electric cleaner
The Torrington is right—in design, material, construction.
Powerful air suction gets all imbedded dirt, the revolving bristle brush gets all surface litter
—and it does it without injury to the rug.
THE TORRINGTON COMPANY
National Sweeper Division
TORRINGTON, CONNECTICUT
Canadian Plant: Upper Bedford, Que

Advertisement Featuring Magazine Seals of Approval.

Long experience in the carpet sweeper business with women has shown this manufacturer the value of the "third party" approvals. This concern has obtained favorable ratings from a wide range of magazines and also from organizations—even the London Institute of Hygiene is represented. In making sales, all these authorities will vouch for the appliance if the dealer will but call on them to give testimony.

while to remember this and bring it in as a selling argument. When she buys such an article as an electric flatiron, she usually relies to a considerable extent upon her acquaintance with the dealer, or his reputation in the community. If she is acquainted with him, that gives her more confidence in the device. But even so, she is likely to select the product of a manufacturer who advertises nationally and has built up a name which he is likely to want to protect. If in addition, when she comes to choose between two or three nationally known makes of flatiron, the clerk can point out that one has passed the test of the magazine laboratories successfully, that one is most likely to become her choice. The magazine approvals are too often neglected in the electric shop. They are worth playing up. Have some cards made carrying the seals and use them in a window display. Refer to them when it comes to clinching a sale. Say, "Why, madam, *Good Housekeeping* and *Modern Priscilla* magazines give this appliance unqualified endorsement. Not only that, but they offer to give your money back if you are not satisfied with your purchase."

Then pick up a copy of the magazine—there should be several on a table in the salesroom—point to the advertisement and then to the guarantee and the approval. If ever there was a convincing argument, it's that. There's absolutely no "come-back" to it.

"This is to certify," says the approval certificate of *Modern Priscilla*, "that the article above named was tested in the *Priscilla* Proving Plant and found satisfactory under home conditions and expert examination. We therefore authorize the use of our official *Priscilla* Proving Plant Seal of Approval upon any label or advertisement of this article." And on the editorial page appears the following advertising guarantee:

SATISFACTION OR MONEY BACK.

We, the publishers of THE MODERN PRISCILLA, guarantee the reliability of every advertisement appearing in this magazine.

You may purchase merchandise or food products advertised in THE MODERN PRISCILLA confident that if they do not prove satisfactory your money will be refunded either by the manufacturers or by us. "Satisfaction or Money Back" is our unqualified guarantee.

This guarantee applies whether the purchase is made from the advertiser direct or through your home-town merchant. The only condition is that, in purchasing, you are to state that you saw the advertisement in THE MODERN PRISCILLA.

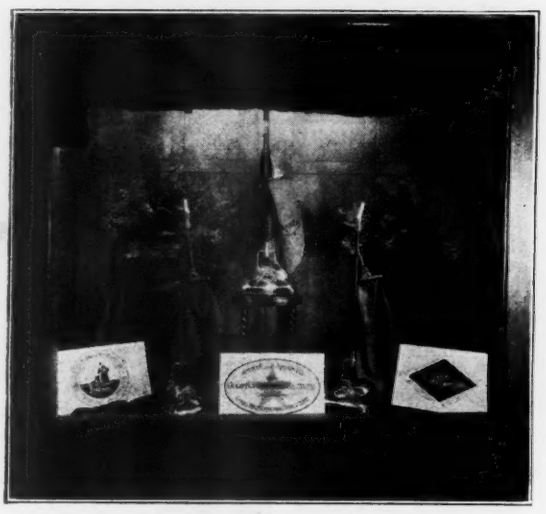
If you have any cause for dissatisfaction please communicate with us immediately, giving all the facts relating to the transaction, and addressing your letter to

ARTHUR J. CROCKETT,
Advertising Director.

Many of the 650,000 subscribers to *Modern Priscilla*, and their friends who are also readers of the magazine, have become accustomed to rely upon this approval and guarantee. The publishers receive numerous unreasonable complaints against advertisers, of course, but when a claim is just the publisher sees that it is satisfied. *Modern Priscilla* receives on an average 10 or 12 complaints a week, according to Mr. Crockett, manager of that paper.

"Most of these," he said, "are due to impatience on the part of the reader and are made against the largest and most reliable concerns. All such complaints, however, are given prompt and careful attention."

Refunds in the normal year have averaged about 12 in number. The magazines, obviously, are going to a good bit of trouble to help the dealer sell nationally advertised and carefully tested appliances. Isn't it the part of good salesmanship to "cash in" on these efforts?



This Dealer Displays Magazine Approvals in an Attractive Window.

A liberal education may be gained by studying the advertising columns of trade papers.

VILLAGES OR GROUP OF FARMS FED FROM SMALL PLANT.

Equipment Developed for Government During War Period Available for Use Where Several Customers Require Small Amounts of Energy.

According to the latest information available there are 125,929 towns and villages in the United States having a population of under 1000 inhabitants. A large proportion of these towns are entirely without electric service and without prospects that central station lines will be extended to give them service. There are also many large farms and small communities which require power and light in excess of the amounts given by the usual farm lighting plant. Allis-Chalmers Manufacturing Co., Milwaukee, is marketing two standard sizes of 110-volt gasoline-engine driven generating plants complete, rated at 5 kw. and 15 kw., respectively.

A typical village installation is shown in the accompanying illustration. This shows one of the standard 15-kw. units supplemented by batteries. A set of this capacity will successfully serve up to 50 average village buildings including stores, churches, garages, etc. Many such village installations have been made and, in every case reported, complete satisfaction is manifested by users of power and light from these sets. The sets are self-contained and consist of 4-cylinder, 4-cycle engines direct-connected to standard Allis-Chalmers generators mounted on rugged castiron base plates. All accessories used are selected with the greatest care and with a view to constant service and durability rather than low initial cost.

These units were developed to meet the specifications of the U. S. Government for exacting service during the war, and a large number of them were ordered by the Ordnance and Air Craft departments. Repeat orders and satisfactory reports given by Government officials indicated that they were eminently successful in this kind of service.

The installation of a 5-kw., 110-volt unit on a farm means an abundance of power for operating motors up to 3-hp. capacity as well as furnishing lights for all the buildings and power for all the electrical appliances so useful to the farmer and the farmer's wife. Batteries may or may not be used as desired. It is usually advisable, however, to install batteries so that a supply of energy is available at all times, regardless of whether the generator set is operating or not.

People living in outlying districts want electric service and are ready to pay for it. They want to avail themselves of the use of electrical necessities to the modern home. The installation of a reliable isolated plant of ample capacity will insure a constant source of electricity for power purposes as well as for light at a reasonable rate, at a reasonable initial cost and without any delay. Since such sets have been available many villages and communities are organizing small companies or groups of individuals for their purchase and installation.

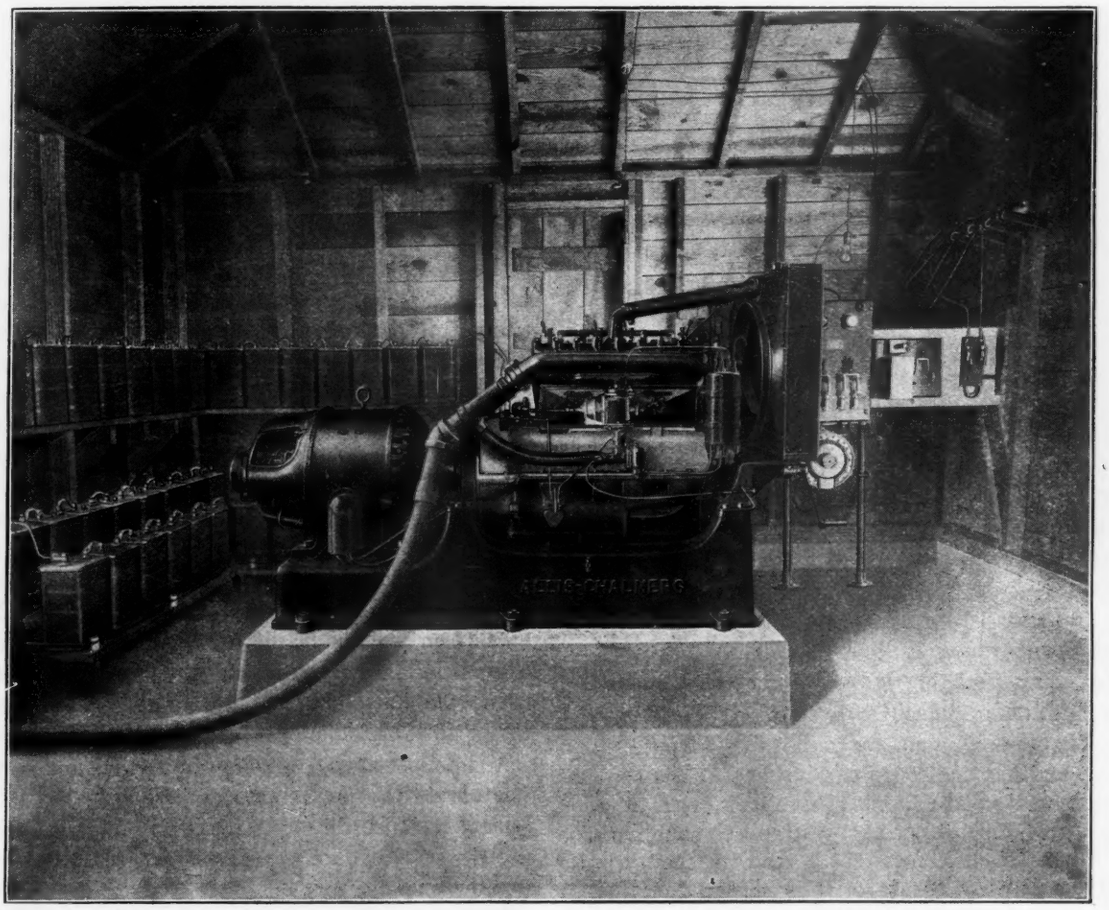


Illustration of Typical 15-Kw. Lighting Set for Village Use—Installation at Battleboro, N. C.

EDITORIAL COMMENT

Farm Life

Who does not remember with a thrill those childhood visits to the home of the cousin on the farm? There were horses and cows and the many other things that interest the boy from the city, but mean only "chores" or work to the boy on the farm. The farm is a place of long hours and hard work at best, but it is a place where an honest and intelligent man may make a living and provide for his old age and his family, and at the same time feel a certain pride in the knowledge that his labors are for the good of his fellow man.

Every successful farmer wants his son to have an education and also in most cases wants him to take up the management and operation of the property when the father is ready to retire. But in the process of gaining his education many a promising farmer of the future has learned to hate his old methods of living to such an extent that no inducement is sufficient to take him back to his old home, or to any home that lacks the ordinary conveniences of the city life of which he has had a glimpse.

Comfortable light, heat, a bathroom, and a certain amount of mechanical power are some of the things that the farm boy has come to demand as his right in compensation for the long days of farm work. It is unnecessary to discuss the why of this situation. The situation exists and it must be met; otherwise the fast reducing rural population ratio will sink to a point too low for the economic good of the country. The wise farmer sees in this shrinking ratio of rural population the opportunity for his son, so is still more anxious to keep him on the farm.

The electrical industry has the one most powerful agency for keeping the sons of successful farmers at home where they may prosper and continue to feed the nation. "Electricity on the Farm" will keep the boys at home, and at the same time help "father" increase his own earning power. In addition, electricity can lift a great load from the shoulders of the farmer's wife. This probably is one of the most important elements in the entire proposition. If "mother" has worked from early morning till late at night, and has had to go without any of the conveniences that she might have had even in a small town, she is not apt to urge her daughters to follow in her footsteps. And if the girls will not live on the farm it is certain that the young men are going to find work in the shops or factories of the city or some place where the girls will live.

Fathers on the farm are recognizing these conditions and are correcting them just as rapidly as they can. The automobile industry has reached out a strong hand to the farm, and the farmer of the country have paid into this industry many millions of dollars. In some sections the electrical industry has commenced to turn to the farm also, and in these sections the farmer has responded in splendid fashion.

The farm is now considered as a factory requiring supplies, labor and power, and prodcing food products. If power can be used to replace labor then there is a chance to operate the "farm factory" at a better profit or with greater certainty of success. There are reasons enough why the farmer needs electricity, and there are still greater reasons why the city population should want the farmer to have it. The farmer can afford to buy this form of service; in fact, he cannot afford not to buy it. In addition to all this, it should be realized that the entire population of the country can ill afford to withhold from the food producers any tool or service that will reduce their cost of operation.

Electricity will help to hold the rural population intact, and will also provide a most valuable agency for the reduction of farm-operating costs. Consequently, it seems evident that the electrical industry must find the way to supply the farmer.

The farmer as a customer will develop gradually, first being only a user of light, but later taking full advantage of the many conveniences of electricity. Of course, each individual will not go through this change, for many will be educated to the conveniences of electricity before they actually are provided with service of any character.

Because of this required development the electrical industry should not expect to reap a maximum return at the start. Also, because of this required development it may be that the original installation will not be the final one. And it may be that the farmer cannot have exactly the kind of service that he thinks he wants. Thus, in this as in every other proposition, the final solution is almost always a compromise of some sort that covers the main features involved. In the present instance the main feature is to introduce electric service onto the farms where it is not already available.

Contractor-dealers have a long list of real

prospects in the farmers of their community. With service available the farmer is a ready customer for a great variety of convenience and utility devices, all of which mean business for the contractor-dealer. If service is not available then the farmer is a prospect for the installation of service in some form. It may be that in certain cases the contractor-dealer can interest himself to good advantage in the promotion of line service from a central station system. This type of development as a rule takes much time and effort to promote, but in the end brings in a number of customers.

There will be other conditions under which it will prove to the advantage of the contractor-dealer to install local plants. Such installations, as a rule, can be sold much more easily than a line proposition, but each sale represents only one customer. However, where one satisfactory plant is in service others will be in demand, and the initial sale may be multiplied many times.

It is not possible for one man to determine what is best in all cases, but it is possible for the entire electrical industry to improve the condition of the farmer by giving him the kind of service that his individual needs demands.

Contractor-Dealer and the Farm Electrical

Who shall sell the farmer electrical service if not the electrical contractor-dealer? For purposes of discussion we will, of course, have to eliminate the majority of those contractor-dealers who operate in the large cities of approximately a million or more population. In such cities the visiting farmers would much prefer to go to an establishment specializing exclusively in farm lighting plants or to one of the farm implement houses carrying such plants—at least for the present. Later, when the use of electricity becomes more general in rural communities, the farmer is likely to stop in at any electrical store on his visit to the big city where the displays of household appliances and labor saving devices in the show window attract his attention.

The contractor-dealer best situated to take immediate advantage of the awakening field of rural electric service is he who operates in the smaller cities and towns where the opportunity is greater to become acquainted with and build up a clientele on personality and good fellowship. There are instances, however, where some alert contractor-dealers who operate successful electrical appliance stores in the larger cities also conduct a branch store in a neighboring small town that is the center of a good farming community. In the branch store they specialize in farm light and power plants and electrical appliances and devices adapted for use on the farm.

Experiences differ as to whether the farm light and power plant should be handled as an exclusive specialty or by contractor-dealers who have the requisite technical knowledge of electricity, but they are unanimous in the declaration that the only successful means of selling to the farmer is to go out to his farm instead of trying to sell him over the counter. That applies to the sale of farm service plants as well as central station service. The specialist must, of course, be versed in sufficient electrical knowledge to install the plant and requisite wiring if he would be a success. And if he has a depot or office in town where farmers are invited to drop in and visit and inspect equipment, it must be a place in which the farmer can feel at home. Some farm plant specialists argue that the majority of farmers will not congregate where the building is imposing and the interior is scrupulously clean with the stock well displayed. This class of specialists advance instances where the abandonment of a ramshackle building for an imposing modern store had driven the farmer trade away.

Let the electrical contractor-dealer be not deceived; the old-fashioned farmer who preferred the ramshackle store with the old rusty stove sitting in the midst of the sand box for the reception of tobacco juice, is fast disappearing with the kerosene lamp and the broken-down horse vehicle. The automobile and farm tractor paved the way to better farming methods and higher desires in the bosom of the farmer who, today, is difficult to distinguish from the city chap on his own streets. The modern farmer detests filth and feels nearly as much at home in the big, bright, clean stores and about the leading hotels as a commercial traveler. Contrary to the old order of rural deliberation, the modern farmer is a thorough business man—often curt—with quick decision and nearly always in a hurry about his business. He does not like to argue upon nor be confused by technicalities beyond his comprehension. He is a good listener when in quest of information and enlightenment on subjects that will lighten his load and brighten his life. He has listened and learned until he knows all that is necessary for the average man to know about electricity—that it makes better light and can readily be applied to save considerable wear and tear on the muscles of himself and his family, thus conserving their vitality and giving them greater comfort and longer and happier lives. All good farmers are more or less fair mechanics and can quickly understand and follow instructions as to the maintenance of the electrical apparatus they may purchase. All they demand is square dealing.

Electrical utility companies are working as fast as possible toward the development of rural trans-

mission lines for general service, but that takes time. Eventually central station service will become available to practically every farmer in the greater part of the United States. In the meantime the central station people have come to recognize that the farmer who first acquires a farm light and power plant which is operated through the agency of a gasoline engine will be a much better customer of central station service when the high-tension farm lines are ready to come his way.

It is generally agreed that the best way to sell a farm plant is to make personal calls on the farmer at his home, observe conditions and requirements and sell a plant according to his needs. Every farm presents a different problem as to electrical requirements. The variation may not be great but each farm presents individual characteristics that should be considered if the salesman would make the kind of sale that will give the best possible satisfaction and make of the purchaser a regular customer whose trade will be assured as electrical service is developed to meet his needs.

Not all contractor-dealers who would handle farm plants are so situated that they can visit in person their farmer prospects. Some of them find it more profitable to direct their business from the office, employing salesmen, solicitors, electricians and others to do the actual work. In such cases it is found expedient to employ one or more salesmen who are or can be made competent specialists in the sale of farm plants and appliances that go with them. Where the contractor-dealer sees fit to leave others in charge of his store and home contracting business while he goes personally into the country to sell farm plants, he usually finds that his first installation sells others without much effort to neighboring farmers. After he has his reputation safely established and has scattered his installations over the territory where it is convenient for other farmers to become interested through gossip and visits to neighbors, the contractor-dealer may safely turn the field over to a competent employe whom he has trained for the work.

Let a contractor-dealer procure a motor truck, load into it a farm plant and go out into the country to some farmer who will let him demonstrate a few of the labor saving accomplishments of the plant. The contractor-dealer has the opportunity to "get the lay of the land" and note the requirements of that particular farm so that he can advise as to the best installation and state a definite cost to the farmer. The farmer is better able to understand the utility of the plant when he sees it on his own ground and in his own surroundings. He is more likely to buy and the sale is more certain to be satisfactory.

Advantages of Permanency in Technical Positions

This is a day of specialization, and modern progress along technical and industrial lines is in no small measure due to that important fact. While a man who is not a specialist at a given sort of work may do it after a fashion, there are few jobs so simple that it is not best to have them done by the specialist whenever it is possible. In any case, this means economy of time, at least; in electrical work it counts also for safety and for everything else which makes for a maximum of efficiency.

The correctness of these statements is so obvious that remarks of this kind are quite liable to appear commonplace and unnecessary. Nevertheless, it is true that in some branches of the electrical field there is very great need for a keener and more general appreciation of the fact insisted upon here. Witness, for example, the frequent changes in the employes of municipal electrical departments and municipally operated lighting plants in many of the towns and smaller cities of the country. In the case of such departments it is altogether too often true that a political zeal for the benefit of the party that happens to be in the ascendant locally is powerfully effective in the matter of securing and holding a position, if, indeed, it is not an indispensable qualification. Even where control by civil service boards is supposed to govern, there is not always to be found perfect immunity from such conditions despite the very excellent intentions of ordinances.

How unfortunate these conditions are, need not be further commented upon. Though the possession of one of these accomplishments is not proof of any lack of the other, there is certainly a great difference between technical knowledge or professional experience and political proficiency.

Where the positions in the city departments are of such a nature that, in order to insure against serious hazards to the public and to render certain special or technical service, men of obviously higher than ordinary training are required, such men should be retained in their positions regardless of shifts in the administrative halls. In the cases requiring temporary services of a special or technical nature, as, for instance, special electrical inspections, such service could be more efficiently rendered by a trained, non-political man, such as an electrical contractor, than by a political friend of one of the political officials whose chief qualification might be that of obtaining votes. Safety, economy and convenience to the general public demands services more substantial than that of the spoils system.

THE WEEK'S NEWS

Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests

SOUTHEASTERN DIVISION TO HAVE POWER SALES BUREAU.

Among the subjects that created considerable interest at the recent convention of the Southeastern Geographic Division of the National Electric Light Association, mention of which was made on pp. 633-634, Oct. 22 issue of ELECTRICAL REVIEW, was the report of the Meter Committee, a great deal of which was devoted to the discussion of the development of instruments for measuring the kilovolt-amperes of actual demand. A schedule for the coming year, in addition to the regular work, involves the formation of a power sales bureau of the Southeastern Division with a committee which will undertake to co-ordinate the sales efforts of the larger power companies.

The following officers were elected for the ensuing year: President, D. A. Cheney, Orlando (Fla.) Water & Light Co.; first vice-president, F. D. Mahoney, Alabama Power Co., Birmingham, Ala.; second vice-president, W. R. Sammons, Knoxville (Tenn.) Railway & Light Co.; third vice-president, Howard Hall, Western Electric Co., Atlanta, Ga.; secretary, C. A. Collier, Georgia Railway & Power Co., Atlanta, Ga.; executive committee, H. A. Orr, Southern Public Utilities Co., Anderson, S. C.; L. L. Newman, Birmingham (Ala.) Railway, Light & Power Co.; F. E. Fletcher, Tampa (Fla.) Electric Co.; C. D. Flanigan, Athens (Ga.) Railway & Electric Co.; H. B. Whiteman, Chattanooga (Tenn.) Railway & Light Co.; E. H. Ginn, General Electric Co., Atlanta, Ga.; H. A. Coles, Westinghouse Electric & Manufacturing Co., Atlanta, Ga.; P. A. Tillery, Carolina Power & Light Co., Raleigh, N. C., and S. B. Irelan, Montgomery (Ala.) Light & Water Power Co., (ex-officio).

INDUSTRIAL COST ASSOCIATION TO MEET IN PITTSBURGH.

Inventories, Federal Taxation and Other Important Subjects to Be Discussed at Second National Industrial Cost Conference.

"What the Sales Manager Should Have from the Accounting Department," "Idleness and Its Relation to Industry, in Retrospect," and "How Can a Cost System, Although Efficient, Demoralize an Organization?" are among some of the important subjects to be discussed at the Second National Industrial Cost Conference to be held Nov. 2-4 at Pittsburgh. Conference headquarters will be at the William Penn hotel. The program as arranged for the meeting follows:

Wednesday, Nov. 2.—Address by Horace S. Peck, president, Industrial Cost Association, and comptroller, S-K-F Industries, Inc., New York City; address of welcome by E. V. Babcock, mayor of Pittsburgh; address by S. B. Taylor, general sales manager, S-K-F Industries, Inc., New York City, on "What the Sales Manager Should Have from the Accounting Department," discussion led by G. K. Wilson, assistant secretary, Sullivan Machinery Co., Chicago; address by E. C. Grimley, Victor Talking Machine Co., Camden, N. J., on "Inventories; Methods of Taking, Perpetual Versus Annual; Cost or Market," discussion led by Christopher Haigh, supervisor of costs, General Electric Co., West Lynn, Mass.; address by F. S. Willett, comptroller, Dodge Manufacturing Co., Mishawaka, Ind., on "Responsibility of the Comptroller or Accountant in Times of Business Depression," discussion led by F. C. Poag, Allied Chemical & Dye Corp., New York City; address by T. W. Dinlocker, assistant comptroller, S-K-F Industries, Inc., New York City, and A. W. Wainwright, works auditor, Skayef Ball Bearing Co., Hartford, Conn., on "Idleness and Its Relation to Industry, in Retrospect."

Thursday, Nov. 3.—Address by Addison Boren, Yale & Towne Manufacturing Co., Stamford, Conn., on "Terminology"; address by H. S. Breitenstein, chief accountant, Bureau of Accounting Revision, Department of Comptroller, City of Pittsburgh, on "Budgeting the Plant and Office," discussion led by Weston J. Hibbs, treasurer, U. G. I. Contracting Co., Philadelphia; luncheon at the H. J. Heinz Co. main plant; address by J. B. Ayres, sanitation and safety engineer, National Tube Co., McKeesport, Pa., on "Sanitation and Safety"; address by Major William Hogg, assistant to vice-president, National Tube Co., Pittsburgh, on "Cost and Profits of Welfare, Sanitation and Safety." An informal banquet will be held at 7 p. m., with President Peck as toastmaster. The following addresses will be given: "Looking Into the Future," by Newcomb Carlton, president, Western Union Telegraph Co., New York City, and "Federal Taxation," by Sanford Robinson, New York City.

Friday, Nov. 4.—Address by J. M. Howell, supervisor of costs, General Electric Co., Schenectady, N. Y., on "How Can a Cost System, Although Efficient, Demoralize an Organization?"; discussion led by Ernest J. Wessen, cost engineer, W. T. Rawleigh Co., Freeport, Ill.; reports of committees; luncheon at the Pittsburgh Chamber of Commerce, and plant visits.

NEW YORK RETAIL DISTRIBUTORS OF APPLIANCES ORGANIZE.

For the purpose of putting on a higher plane all factors entering into the retail selling of household electrical appliances, the Electrical Appliance Distributors' Association has been formed. All dealers and distributors selling electrical household appliances direct to the user or consumer are eligible to active membership, while manufacturers or others interested in the household electrical appliance business can become associate members.

The following companies are charter members: Laun-Dry-Ette Sales Co.; W. T. Leonard, Inc.; J. L. Lund Manufacturing Co.; John Jorgensen Co.; Duntley Manufacturing Co.; Kimball Electric Co.; Ohio Electric Co.; Eureka Vacuum Cleaner Co.; Disbecker & Co.; Gilbert Electrical Specialty Co.; Premier Service Co.; Home Devices Corp.; Hoover Suction Sweeper Co., and Hartt & Lane. At a recent meeting, the following officers were elected: President, James McClymont, Laun-Dry-Ette Sales Co.; vice-president, Samuel Kimball, Kimball Electric Co.; secretary, Inkerman Bailey, Eureka Vacuum Cleaner

Co., and treasurer, J. N. Adam, Hoover Suction Sweeper Co.

The next meeting is scheduled to be held at the City Club of New York, 55 West 44th street, at 8 p. m. Wednesday, Nov. 2.

FARM LIGHT AND POWER PLANTS AT RURAL EXPOSITION.

Surrounding Toledo, O., are a great many of the most thrifty farmers and small fruit growers in the country. From a district that embraces northwestern Ohio, southern Michigan and northeastern Indiana these farmers and their families assemble in Toledo along about the first of December of each year to attend a big exposition that is peculiarly their own. They visit with each other, discuss important topics on the advancement of farm life, and study and select for their use the latest types of farm machinery and appliances from the large number of exhibits of the manufacturers displayed in the mammoth Terminal Auditorium where the show is held. Chief among their purchases of recent years have been farm lighting plants for electric power and light, and electrical appliances for both the dwelling and the out-buildings.

The National Farmers' Exposition was founded 8 yrs. ago by H. V. Buelow with the idea in mind of establishing an event for farmers that would come after the harvest season when they had marketed their crops. At such a time the farmers were most able to do their winter and holiday shopping and replenish their farm equipment. The exposition was made to embody all the essentials of a state fair—except the horse racing and games of chance—where the manufacturers could assemble a large machinery market and demonstrate their appliances. It proved a success from the first.

This year Mr. Buelow has set the dates for Dec. 5-11, and he informs ELECTRICAL REVIEW that there will be eight farm light plant demonstrations by as many different manufacturers. He says the farmers of that section are anxious to obtain central station service but they are buying and installing large numbers of the gasoline engine-driven plants so they may have the benefits of electricity to lighten their labors now. When the high-tension lines come their way they will be well prepared for the larger service.

ENGINEERS DISPLAY INTEREST IN ENGINEERING FINANCING.

An auditorium crowded to capacity faced the speakers at the joint meeting held in the Engineering Societies building, New York, on Wednesday evening, Oct. 19. This was the first of seven joint meetings scheduled for the ensuing year by the New York sections of the four large engineering societies—American Institute of Electrical Engineers, American Society of Mechanical Engineers, American Institute of Mining Engineers and the American Society of Civil Engineers.

With Farley Osgood, Public Service Electric Co., Newark, N. J., presiding, the first speaker was Arthur B. Leach, A. B. Leach & Co., who had as his subject the "Financing of Large Engineering Undertakings." Mr. Leach reviewed the present financial condition of the country and compared the national war debts and foreign trade exports of this and preceding years and in conclusion asserted that before big new enterprises could be financed today the great plants built during wartime must be made efficient and economical and engineers must face the fact that the public wants to be assured that the plans for these new undertakings are 100% efficient before investing.

Philip Cabot, White Weld & Co., spoke on "The Engineer a Failure as a Financial Manager," and in substance stated that it was not possible for engineers to be leaders and promoters in financial matters; what was needed was sympathetic financiers who could appreciate conditions and would advise accordingly. In the discussion which followed, J. H. Williams, Day & Zimmerman; Calvert Townley, Westinghouse Electric & Manufacturing Co., Louis H. Nash and Blaney Stevens took part.

DISCUSS DEVELOPMENT OF FLASHLIGHT BATTERY.

Demonstrations of Radio-Luminescence Given Before New York Section Meeting of Illuminating Engineering Society.

The New York section of the Illuminating Engineering Society held its first meeting of the ensuing administrative year on Oct. 20, and in addition members of the Metropolitan district of the New York State Association of Electrical Contractors and Dealers, New York Division of National Council of Lighting Fixture Manufacturers and the Association of Lighting Fixture Manufacturers attended.

The first speaker was Dr. V. F. Hess, U. S. Radium Corp., who spoke on the subject of "Radio-Luminescence and Its Application." After discussing the sources of phosphorescence in general, Dr. Hess described the difference between the normal phosphorescing as developed by ordinary light and that produced by the rays of radio active substances. A motion picture film, showing the process by which radium is extracted from the ore and how luminous materials are prepared for practical applications, was then presented and actual demonstrations with different luminous materials made.

An interesting paper on "Flashlights and Flashlight Batteries" was given by E. H. Mathews, American EverReady Works, accompanied by a demonstration of various types of flashlights and a motion picture film showing the process of manufacture. Mr. Mathews said that the flashlight was invented in 1898 by David Misell who also developed the first flashlight battery. The first flashlights, which were exhibited about 20 yrs. ago at the Electrical Show in Madison Square Garden, New York City, excited considerable interest but no one realized that it was a utility light. Great difficulty was experienced in marketing the early batteries due to their short life and lack of facilities and the unwillingness of lamp manufacturers to make miniature lamps with a carbon filament taking 4 watts per horizontal candle power. The present battery is much more efficient than the first made and now some manufacturers market flashlight

cells instead of batteries and in this way the dealer carries less inventory and the consumer obtains a fresher cell.

There are four general classes of flashlights. First, the tubular, which is for use at distances from 10 to 20 ft. Second, the lantern, used generally as safety light. Third, the vest pocket, which is used for its portability and convenience. The fourth class is the spotlight or protective type, which is designed for use outdoors by motorists, police officers, firemen, and industrial workers. It is a focusing light equipped with a parabolic reflector, a highly concentrated filament lamp and is capable of illuminating at 300 ft., and further when the object is large and light colored.

Over 580 patents have been allowed covering flashlights, hand lamps and combinations involving flashlights. The flashlight has no competitor as an emergency light and during the past year the business totalled $20,000,000. It is estimated that there are over 10,000,000 active users of flashlights in the United States and that over 5,000,000 are sold annually. Over 25,000,000 batteries are manufactured yearly for use in these flashlights.

Great use was made of the flashlight by the government during the war, both in the field and for manufacturing purposes at home. Many dramatic incidents have been cited where the flashlight has played an important part such as the rescue of shipwrecked passengers and particularly in the floods at Pueblo.

UTILITIES ASSOCIATION OF WEST VIRGINIA ELECTS OFFICERS.

The annual convention of the Public Utilities Association of West Virginia, report of which appeared on pp. 631-632, Oct. 22 issue of ELECTRICAL REVIEW, closed with the election of officers, all the present officers being re-elected, as follows: President, Herbert Markle, Bluefield, W. Va.; first vice-president, C. P. Billings, Wheeling, W. Va.; second vice-president, Mentor Hetzer, Moundsville, W. Va.; third vice-president, E. W. Alexander, Charleston, W. Va.; treasurer, A. M. Hill, Charleston, W. Va.; secretary, A. Bliss McCrum, Charleston, W. Va.; executive committee, W. P. Hawley, Bluefield, W. Va.; C. C. Bosworth, Elkins, W. Va.; W. R. Power, Huntington, W. Va.; A. H. Grimsley, Clifton Forge, Va.; A. C. Babson, Charleston, W. Va.; H. S. Newton, Parkersburg, W. Va.; C. S. McCalla, Charleston, W. Va., and C. H. Brues, Wheeling, W. Va.

ELECTRICAL APPLIANCES MEETING WITH READY SALE.

Sales of electric ranges continue in a volume which justifies the predictions made in trade circles earlier that the year 1921 would witness a remarkable demand for these appliances. The "push" which the Public Service Company of Northern Illinois is putting behind them is confined to those parts of the territory not supplied with gas service. During the past 2 mo. a number of demonstrations have been held in small towns principally, followed in each case by immediate sales and the creation of prospects who will become buyers later. It is intended to continue these demonstrations throughout the fall.

The general demand for electrical appliances is led by the labor saving appliances, particularly vacuum cleaners and flatirons. Sales of portable lamps are considerably in advance of those made in the same period last year. Cooking utensils and the numerous smaller articles are also wanted, the latter articles especially in the larger towns. A number of special sales have been held in the last 2 or 3 mo. The campaign plans covering the period up to the beginning of the Christmas trade include a number of special sales.

FRANKLIN INSTITUTE AWARDS TATE AND CRESSON MEDALS.

The Franklin Institute, Philadelphia, acting through its Committee on Science and the Arts, awarded Oct. 19 its Elliott Cresson gold medal to Dr. Byron E. Eldred of New York City, for his low expansion leading-in wire for incandescent electric lamps. At the same meeting the Institute awarded to Alfred O. Tate, of Cranston, R. I., its Howard N. Potts gold medal for his electrolytic process and waterproofing textile fabrics. After these medals had been presented by Coleman Sellers, Jr., vice-president of the Institute, and duly acknowledged, Ralph Modjeski, chief engineer of the Delaware Bridge Commission, delivered a lecture on "The Delaware River Bridge Between Philadlphia and Camden."

ANOTHER LARGE POWER PLANT ON PACIFIC COAST.

Southern California Edison Co. Starts Construction of Big Creek Powerhouse No. 3 on San Joaquin River for 150,000 Kw. Capacity.

The California Railroad Commission has authorized the Southern California Edison Co., of Los Angeles, to construct an additional plant in its Big Creek hydroelectric development, to be known as Big Creek powerhouse No. 3. This powerhouse is planned for a capacity of 150,000 kw. Two generating units of approximately 25,000 kw. each will first be installed. A forebay reservoir will be created by a diversion dam on the main San Joaquin river, diverting the waters to the powerhouse intake through a tunnel 23 ft. diam., approximately 6 mi. long.

The Huntington lake and Shaver lake waters, in addition to the main San Joaquin river waters, are now available to the site of this powerhouse, while the ultimate supply will be 500,000 acre-ft., at approximately 7000 ft. elevation and 825 ft. total effective head at the turbines. This enormous supply of water available for power purposes throughout the entire year will come from the combined capacity of Huntington and Shaver lakes, and the main San Joaquin river with the system of reservoirs to be constructed for conserving and delivering the waters of Florence lake, Blaney meadows, Vermilion, Granite, Jackass and Chiquita creeks.

One million barrels of fuel oil, the consumption of steam plants necessary to produce the equivalent amount of electrical energy, will be

saved by an output from this powerhouse of 204,000,000 kw-hrs. of electricity in the year 1923. Less than $0.005 per kw-hr. is the estimated cost of production of electric current by the initial development. This cost will be reduced by the ultimate development to slightly in excess of $0.002, as compared with an average cost of $0.007 per kw-hr. for steam generated current.

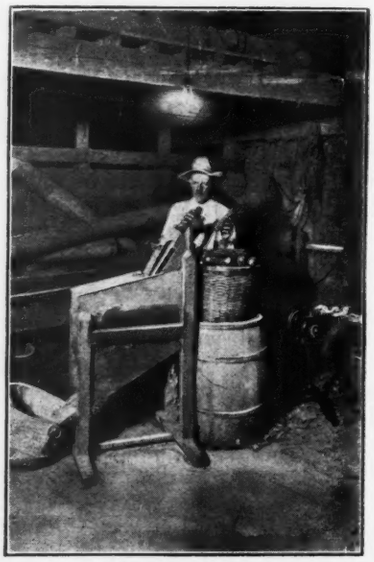
The first unit is planned for completion in April, 1923, and the second unit in July of the same year. An expenditure of $11,500,000 will be required up to that time. The cost of the complete development is placed at $17,500,000. Upward of 92,000 hp. of new hydroelectric energy has been brought into service this year by the Southern California Edison Co. on Big Creek, the San Joaquin and Kern rivers, and the company now has a force of 2500 trained men driving the new project to a successful conclusion.

CHEAPER TO DO IT BY ELECTRICITY ON THE FARM.

Electric Power Saves Much Physical Effort and Reduces the Number of Horses Required for Various Agricultural Operations.

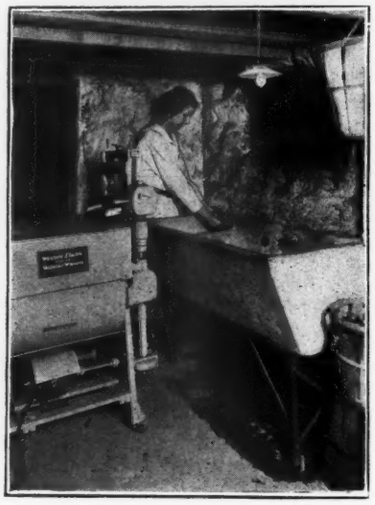
"It's cheaper to do it by electricity." That is the way an owner of a 500-acre farm in Nebraska explained his Western Electric 110-volt outfit. This man knows what it cost him for labor before he had his plant. He knows how much labor his power plant saves every month, and he says that this plant is a capital investment and one that any ordinary sized farm can afford to carry. He found that he could use electric motors for so many kinds of work on his farm that he needed but few men to do the work, and the outfit was so easy to take care of that it was no chore at all to keep it in trim.

When one considers all the work it performs; the conveniences and comforts it brings to the home, running the outfit and keeping it in shape is an easy task. This kind of equipment is coming to be a regular member of the farm machinery family, and farmers everywhere are learning the real value to them of such a power plant.



Driving the Corn Sheller by Means of a Motor-operated Power Stand.

Here's what one dairy farmer does with his plant. A 7.5-hp. motor operates the hay fork which lifts the hay into the loft. This same motor has 60 ft. of electric cable and is mounted on a truck. At five different points on the farm are attachments from which this large motor is run, and it is used for sawing wood, shelling corn, grinding feed and a good many other such jobs.



Farmer's Wife Enjoys Electrical Application in Her Laundry.

Besides this large motor a 1-hp. motor operates a pump and forces the water up to a supply tank on top of a hill several hundred feet away. A line is wired out to the pasture and in the summer the motor is moved out there and water is pumped for the stock. An automatic water system, washing machine, vacuum cleaner, flatiron and many other electrical machines and devices are used in the house and are run by energy from this plant. This shows what is being done on this farm in using electricity for power. Then there is the lighting of the 14-room homestead, 10-room tenant house, 100-ft. hay barn, corn crib and hog house, garage and 75-ft. machinery barn.

This is electrifying the farm, and it is being done on thousands of farms all over the country. Electric power is practical and economical. It cuts down the waste of hand labor, does the work more efficiently and more quickly. In the home it gives all those comforts and conveniences that rightfully belong to the family—the steady, clean lights, hot and cold running water, vacuum cleaner, washing machine, etc.

INCREASED CALL FOR ELECTRICAL SUPPLIES AT NEW YORK.

Electrical dealers and jobbers in New York City report a noticeably increased call for electrical supplies, particularly of the character used in housewiring, and the outlook for late fall and winter business is good. The Greater City is breaking all previous records for apartment and dwelling construction, the estimated valuation of work of this character reaching $262,614,000 for the first 8 mo. of the present year, as compared

with a total of $237,933,000 throughout the entire year of 1920, an increase of over $24,600,000, with 4 mo. still remaining for the building department to compile its records. The demand for wiring specialties, conduits, etc., is easily taking the lead at the local electrical shops, and dealers are showing no hesitancy in stocking up for anticipated business. Prices are steady and there is no indication of any early decline in levels of staple materials.

IRRIGATION FACTOR IN SUPPLYING FARM SERVICE.

Central Station Company in Northwest Finds it Necessary to Develop Pumping Operations to Make Maintenance of Rural Lines Pay.

By LEWIS A. MCARTHUR,
General Manager, Pacific Power & Light Co., Portland, Ore.

The Pacific Power & Light Co., which serves a large suburban and rural territory in the south central and southeastern parts of Washington, and along the Columbia river in Oregon and in Washington, began the development of rural business in 1910. This business was developed largely as the result of the interest the company took in prospective irrigation by small pumping units. Today this company serves more than 6000 hp. in motors operating irrigation pump outfits, and with this business as a nucleus a large mileage of rural distribution lines along county roads has been constructed.

This company has found from practical experience that it is difficult to develop strictly rural lighting and domestic power in sufficient quantities to justify the building of rural lines unless a reasonable amount of irrigation power is offered in addition. With the present-day costs it does not appear feasible to build rural lines with less than $1000 to $1250 gross annual business to the mile unless, of course, the customer assists financially in the undertakings. It is quite apparent that at least 10 to 12 homes, earning $100 each, would have to be served in a mile of line. This condition would represent unusually thick business with high gross earning capacity; in fact, such conditions are difficult to obtain unless considerable irrigation power is served off of the same distributing system.

In most cases the company builds a 6600-volt line, and all our main lines are constructed 3-phase, and not less than 35-ft. poles are used. The company owns and operates all equipment regardless of whether the customer participates in the cost of the extension or not. There are many advantages claimed for electric irrigation from wells. The water is free from weed seeds and trash and the operation of the irrigation system is entirely under the control of the pumper himself. He is not required to rotate the use of water with neighbors.

The Pacific Power & Light Co. has an interesting class of service in the Hood River valley, in Oregon, where, under special conditions, all customers own and maintain their distributing lines off of county roads. Every fall the company's district manager checks the condition of privately owned distributing lines built away from the main feeders, and notifies the customers of the character and probable cost of the work necessary to put the private lines in proper condition to eliminate hazard. Customers who do not repair their lines within a reasonable length of time are cut off from service. As a practical proposition, however, the company finds that in nearly all cases customers arrange to have their lines put in shape immediately. The company offers to do this work for customers on a jobbing basis and it succeeds in securing a very large part of the maintenance work.

Practically no controversies have arisen over the operations described herein. The system has been in operation more than 11 yrs. and the records indicate that no damage claims have arisen out of failure to maintain privately owned lines. The Pacific Power & Light Co. has found that rural business has stimulated merchandise sales to a very large extent.

ELECTIONEERING BY RADIO.

For the first time in the history of electioneering candidates were able to talk to the public without the latter leaving their homes, when arrangements were made in Pittsburgh by the Westinghouse Electric & Manufacturing Co. to send broadcast by radio the speeches by the candidates. The nominations for mayor proved a very bitter fight in Pittsburgh recently, and radio was called into play to get the messages of the candidates to the people. In this way thousands of persons were addressed at one time without the inconvenience of leaving their own radio set. Each candidate for mayor was sent to the broadcasting station, where he was allowed 5 min. to tell the reasons why he should be elected to the office. This proved to be quite popular and excited a great deal of interest in Pittsburgh and vicinity.

At the recent meeting of the Public Service Section of the National Electric Light Association the followig officers were elected for the ensuing year: Chairman, W. H. Knutz; vice-chairman, L. C. Stephens; secretary, H. A. Ptolemy; treasurer, H. S. Badger; board of control, John Wynn, N. J. Richards, F. P. Elliott, J. H. Boos and A. Herz.

COMING CONVENTIONS.

Second National Industrial Cost Conference, Pittsburgh, Nov. 2-4. Headquarters, William Penn Hotel. Secretary-treasurer, Albert A. Alles, 2828 Smallman street, Pittsburgh.

Society of Naval Architects and Marine Engineers. Twenty-ninth general meeting, 29 West 39th street, New York City, Nov. 17-18. Secretary-treasurer, Daniel H. Cox, 29 West 39th street, New York City.

American Institute of Chemical Engineers. Fourteenth annual meeting, Baltimore, Dec. 6-9. Secretary, John C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

Lighting Fixture Dealers' Society of America. Annual convention, Milwaukee, Jan. 30-Feb. 2. Secretary, J. L. Wolf, Builders' Exchange, Cleveland.

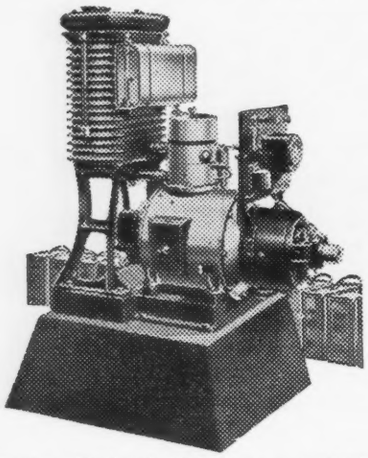
National Council of Lighting Fixture Manufacturers. Annual convention and Lighting Fixture Market, Auditorium, Milwaukee, Jan. 30-Feb. 4. Secretary, Charles H. Hofrichter, 281 Gordon Square building, Cleveland.

APPLIANCES and DEVELOPMENTS

New, Improved or Interesting Electrical and Mechanical Apparatus and Devices, and Applications of Equipment and Methods in Practice

Two Types of Stearns Lighting and Power Plants.

The Stearns Motor Manufacturing Co., Ludington, Mich., manufacturer of farm lighting plants and gasoline motors, makes two models of lighting plants,



Stearns "Deluxe" Model Farm Lighting Plant.

shown in the accompanying illustrations, the main features of which are thus enumerated by the manufacturer:

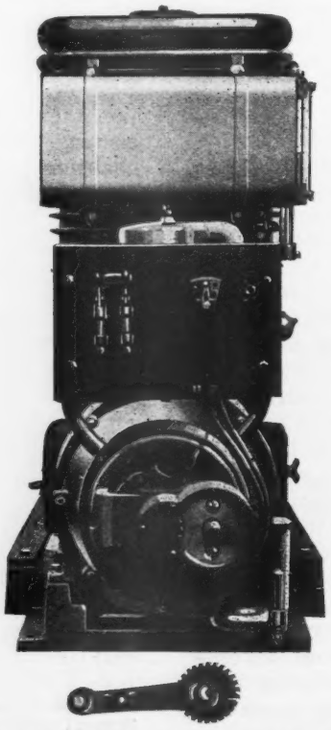
The Stearns "Deluxe" plant starts itself by pressing a switch button and stops automatically when the battery is fully charged. The battery is simply a storage reservoir to hold the excess power (current) created by the motor when the full capacity of the plant is not being utilized. Every vital moving part subjected to wear is first rough-turned and then ground on special grinding machines to a glass-smooth surface.

The generator is bolted directly to the engine case, doing away with the necessity of flexible couplings. Spiral camshaft gears are used and the special oiling gear assures free flow of oil to all parts of the motor. The magneto is mounted on a bracket machined to fit the engine case, making secondary couplings and shafts unnecessary. A spring shutoff switch can be placed in any part of the house, making it unnecessary to go to the plant to shut off the engine. A sediment cup and gasoline strainer with valve are located in the gasoline line. The water tank, gasoline tank and oil reservoir are equipped with glass gages so that the level of water, gasoline and oil line shows at all times. An electric governor automatically regulates the charging of the battery, preventing the generator from charging too fast and the motor from racing. All parts of the motor and generator are easily accessible. By running the plant occasionally enough electricity will be stored in the battery for all ordinary purposes. It is stated that it is not necessary to run the plant when using lights. The Stearns engines are scientifically balanced so that practically all vibration is eliminated.

The Stearns "Deluxe" self-starting battery plant includes a 4-cycle, single cylinder, water-cooled gasoline engine, bore 2⅝ ins., stroke 3 ins.; a 32-volt electric generator, direct connected, capacity 750 watts; an automatic electric governor to control speed of engine and flow of current to battery; a 1-piece iron water tank with condenser and sight gage glass, an iron base platform on tank having glass sight gage; 16-cell, 90-110-ampere-hr. glass jar storage battery, and a switchboard including double line switch, starting switch, magneto switch, automatic cutout, ampere-hour meter and a high-tension magneto for ignition purposes.

A description of the engine on the "Deluxe" and "Simplex" plants follows: *Cylinder*—Gray iron water jacketed, bore ground to ¼ thousandth of an inch to size. *Cylinder Head*—Water jacketed, removable type, with vertical valves-in-head. The cylinder head can be removed for inspection, cleaning carbon out of cylinders, or valve grinding by simply removing four nuts. *Crankshaft*—Drop forged made from 1-piece steel ground to size with taper to fit flywheel. *Flywheel*—Completely inclosed, having fan ribs to produce air suction which prevents generator from overheating. *Ignition*—High-tension magneto.

The company states that in order to fill the demand for a lighting plant reduced to the lowest possible number of parts and a corresponding reduction in price it has perfected the "Simplex" model. The workmanship and design are exactly the same as on the higher



Stearns "Simplex" Plant Ready for Operation.

priced models. In the "Simplex" model the Stearns company has eliminated the use of a battery and switchboard, also the self-starting motor. By using a geared-up hand starting crank it can be easily started. This plant has no batteries of any kind.

The weight of the "Deluxe" plant complete (less battery) is 525 lbs.; crated shipping weight (domestic shipment, less battery) 670 lbs. The shipping weight of the 120-amphere-hr. battery is 640 lbs., and of the 215-amphere-hr. battery 930 lbs. The weight of the "Deluxe" battery, 90-ampere-hr., crated is 525 lbs.; weight "Deluxe" batttery crated for export, 690 lbs.; tare weight 216 lbs., net weight 474 lbs. The weight of the "Simplex" plant is 525 lbs., crated for domestic shipment 670 lbs., and crated for export 705 lbs. The floor space required for the "Utility" or "Simplex" plant is 22 by 36 ins.

The Stearns plants will charge easily and the company can furnish larger sized batteries where heavy current requirements demand same. The company can furnish plants less batteries if desired, and states that it does not sell accessories except batteries and parts for Stearns plants. Lights or power can be used direct from the generator without using the battery, if desired. The ignition system (magneto) is entirely independent of the generator and battery.

The Stearns Motor Manufacturing Co. rates its battery on the 8-hr. continuous discharge basis. Power pulley can be furnished at a nominal cost. The S. A. E. horsepower of the engine is 2 hp. and the engine works satisfactorily with kerosene. The capacity (using generator only) is 750 watts; maximum, using generator and battery, approximately 1200 watts; using engine without battery, thirty-eight 20-watt lamps, which is stated to be ample capacity for electrical household appliances; using engine and battery, sixty 20-watt lamps. The company makes its own (Stearns) generator.

Army Service Proved Value of Universal Plant.

When a portion of the U. S. Army was sent for patrol duty along the Mexican border, with the possibility of invasion, the various detachments were distributed in the dry and open country far from modern conveniences of cities or even small towns. One of the earliest requisitions for equipment for that campaign contained an item for portable electric lighting plants. The government procured 16 such plants from the Universal Products Co., Oshkosh, Wis., the first to be used for such purposes. Afterward approximately 1500 such plants were purchased for the American Expeditionary Forces in Europe.

The Universal Products plant is simply a combination of a standard 4-cycle, water-cooled, poppet valve, single cylinder motor directly connected to an electric generator of standard construction for charging

the storage batteries supplied with the outfit. It is built in sizes for ½ kw., 1 kw., 4 kw., 10 kw. and 15 kw. The 1-kw. plant is said by the manufacturer to be ample for average farm requirements. The following are the specifications for the 1-kw. plant engine.

Cylinder—Close-grain semi-steel, 2⅝-in. bore, 3½-in. stroke. *Piston*—Close-grain iron, three rings and hardened piston pin. *Crank Shaft*—Counterbalanced crank with hardened and ground crank pin. *Connecting Rod*—Phosphor bronze. *Cylinder Head*—Removable, exposing both valves and top of piston. *Ignition*—Uni-sparker with 30-volt coil mounted on switchboard. *Fuel Feed*—High grade float feed carburetor with throttle fitted to governor. *Governor*—Centrifugal ball-type, inclosed in oil-tight case with removable cover. *Valves*—Inlet and exhaust valves positively operated. *Camshaft*—Hardened and ground with hardened screws. *Speed*—Approximately 1200 r.p.m. *Storage Battery*—Sealed-in-glass type, 16-cell, 32-volt; shipped fully charged. Can be supplied in capacities ranging from 90 to 240 ampere-hrs., sizes depending on requirements.

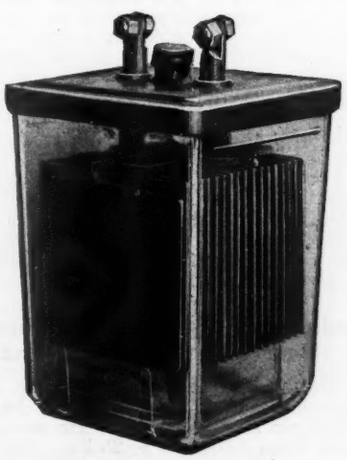
The regulation of the plant is registered by a switchboard which automatically shuts off the motor when the storage batteries are fully charged, and which registers the amount of current being used or charged. The motor is of 2.8 hp., S.A.E. rating, which is ample to generate up to 1 kw., there being 746 watts to the horsepower. The plant is protected as to its lubrication by the standard splash system. An oil sight gage indicates at all times the amount of oil in the oil well, which should be kept approximately half full for best results.

In addition to the Sangamo ampere-hour meter which tells at all times the exact condition of the batteries, there is also a combination ammeter which shows the charge and discharge. A 2-pole line switch controls the line circuit, which is fully protected by fuses. The generating movement is almost frictionless, the generator shaft being equipped with standard ball bearings. The storage battery is of the heavy plate, Faure type, especially designed and built for the Universal Products plant. Special process, active grids prevent excessive sulphating and buckling of plates.

The plant has a generating capacity of 1000 watts continuously, which is equal to fifty 20-watt lamps of 32 volts. In addition to the number of lights or their equivalent in electric current for power from the generating set, there is the battery capacity which will furnish, when fully charged, sufficient current to light nineteen 20-watt, 32-volt lamps continuously for 8 hrs., or where the light or power is used intermittently, which is the case in practically all installations, the storage battery alone will provide sufficient current to light twenty-four 20-watt, 32-volt lamps for a length of intervals totalling 8 hrs.

Storage Batteries for Use With Farm Lighting Plants.

The Westinghouse Union Battery Co., Swissvale, Pa., a subsidiary of the Westinghouse Air Brake Co., has on the market a complete farm lighting battery incorporating the strong mechanical features of the automobile starting and lighting battery with the long life and reliability of the old isolated plant battery. To avoid breakage in transit and to enable the purchaser to eliminate the expense of a supporting bench, a heavy wood packing case has been constructed in which the battery is shipped and which later may be converted into a sturdy bench for the battery when in service. The jar is made of high-quality glass of a uniform 5/16-in. wall, being pressed from a mass of molten glass with the supporting ribs for the elements formed as an integral part. This exclusive feature, besides giving an even and uniform rest for the elements, acts as a channel section to the jar bottom, giving additional strength. The high ribs provide ample mud space so as to make cleaning unnecessary over a long period. A heavy flange is pressed around the upper edge for still further strength, and the proper electrolyte level line is clearly indicated in the wall.



Storage Battery Built Especially for Use with Farm Plants.

The top construction embodies a sealed-in cover similar to that used on starting and lighting batteries. The openings around the post-holes are carefully sealed with compound and this, together with the non-slop vent plug, eliminates the possibility of acid leaking. Plates are of the pasted type, the positive plate being 0.25 in. thick and the negative plate 0.187 in. thick. Heavy antimony-lead grids are used and the paste itself is of a consistency which experience has shown as being best adapted for long life at rated capacity or above. The plates are firmly fastened to heavy connecting straps having heavy posts.

Combination of wood and perforated sheets provide means of separation of the plates, thus retaining the desired high capacity without the sacrifice of long life. All parts are inspected as they progress through the assembly department, as is also each part of the element immediately before being sealed in the glass jar. This last inspection is an effective means of eliminating the mechanical imperfections that would not otherwise be apparent. On account of the large service organization already in operation and constantly being augmented, expert advice and repairs when necessary may be obtained by the owners of Westinghouse farm lighting batteries from an expert in their immediate neighborhood.

A Few of the Chores About the Farm House and Barn That Are Made Lighter and Easier by the Universal Products Plant.

Specializes in Farm Lighting Plants and Equipment.

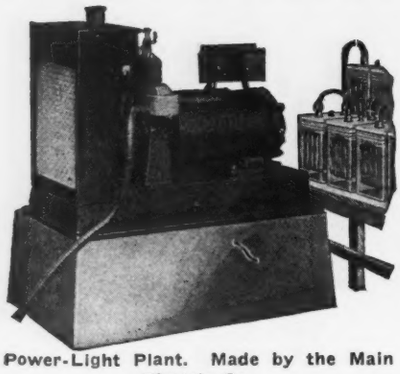
The United Engine Co., with general offices at Lansing, Mich., makes a specialty of farm lighting plants, washing machines, power equipment, gasoline and kerosene engines, milking machines, cream separators, feed grinders and concrete mixers. The officers of the company are: President and manager, C. L. Sprinkle; vice-president, L. J. Munday, and secretary-treasurer, J. G. Finkbeiner. The company maintains branch offices and warehouses at Albany, N. Y.; Kansas City, Mo.; Independence, Ia., and Minneapolis, Minn.

New Main Power-Light Plant for Farm Service.

The accompanying illustration shows the new Main power-light plant produced by the Main Electric Co., Cleveland. The manufacturer states that the plant consists of a simple engine of the 2-cycle type with but three moving parts, using kerosene or low-grade gasoline as fuel. It is water cooled through a honeycomb radiator, employing a fan, which cools in a satisfactory manner and operates 8 hrs. on a gallon of fuel. The plant is furnished with a 32-volt sealed glass jar type of storage battery.

The specifications of the Main power-light plant of the direct connected unit type standard 32 volts are as follows: The engine in the 1-kw. type is of 2 hp., single cylinder, 2⅝ by

2.5 ins., main bearings 3.25 ins. long, with three moving parts, 2-cycle. Cooled by water through a honeycomb type radiator, with the fan on crankshaft. Holds 2 gals. of water. Lubrication, oil mixed 1 to 10 with the fuel; fuel tank in base; carburetor is



Power-Light Plant. Made by the Main Electric Co.

of the Main special type. The fuel consumption is claimed to be 6 to 8 hrs. on 1 gal., and the speed 1200 to 1600 r. p. m., according to load.

The generator is of the improved type, oil ring type bearings with large reservoirs insuring positive lubrication for weeks at a time. Capacity is 1000 watts, 50 lights of 20 watts. The plant is equipped with a 16-cell battery, 32 volts, sealed glass jar type, original Main thick plate type, built by the Willard Storage Battery Co. or the General Lead Batteries Co., with a capacity of 100 lamp-hrs. (20-watt lamps), 60 ampere-hrs. S.A.E. or intermittent rating. The shipping weight of the plant complete with 60-ampere-hr. battery is 585 lbs. The dimensions are base 12 ins. wide by 34 ins. long by 24 ins. high.

In the 1.5-kw. set the specifications are practically the same as for the 1-kw. type, only a steel frame generator giving greater output and ball bearings are used. The set operates at 1500 to 1750 r.p.m. A battery of 90 ampere-hrs. is supplied with the set. The shipping weight of the 1.5-kw. plant is 760 lbs.

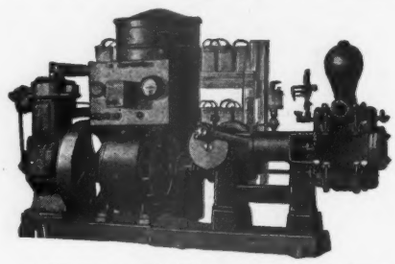
Combined Light and Water System for Farm Service.

By mounting a Kewanee pumping unit on a common base with the 350-U lighting plant the Kewanee Private Utilities Co., Kewanee, Ill., has produced a compact combination system, the cost of operation of which is reduced to a minimum with capacity large enough to make a practical plant. The 3-hp. engine is large enough to drive the generator at normal rate of battery charging and run the pump at full capacity at the same time. From experience it has been found that the water can be pumped while the battery is being charged at practically no additional cost, according to the manufacturer.

Either a suction or deep-well type of pump can be used. The former has a capacity of either 225 or 425 g.p. hr. The deep well type of pump has a capactiy of either 115 or 225 g. p. hr. These pumps are worm-gear driven with the worm operating in a bath of oil. They are noiseless and so heavily built that the necessity of repairs is practically unknown.

The electric plant can be furnished in many sizes. Both engine and pump are started by simply pressing a button. When a certain tank pressure is reached the entire plant is automatically stopped. The pump can be disconnected from the engine with the fingers so that the electric plant only may be operated, or by opening a switch the engine may be used to drive the pump only with the generator running idle. The generator shaft is extended with a pulley mounted on the end. This can be used for belt connecting to other machines. The engine is of the single-cylinder, 4-cycle, jump-spark, volume-governed type, with a bore of 3.25 ins. and a stroke of 4 ins. The jacket water is cooled by the thermosyphon method. All working parts are entirely inclosed, lending themselves to effective lubrication. The generator is of 1500-watt capacity, but is designed for heavy overload. Batteries supplied with these plants are of the closed glass jar type with thick plates and specially treated wood separators. Extra large space for sediment is left at the bottom of jar. These plants can be furnished for 30, 60 or 110-volt service.

The electric plant can be furnished as a separate unit, being entirely complete in itself. The engine is equipped with ball bearings to insure easy running and freedom from vibration. The switchboard is equipped with a field rheostat by which it is possible to charge the batteries either at a high rate or a slow tapering rate, depending on their condition. The large generator makes

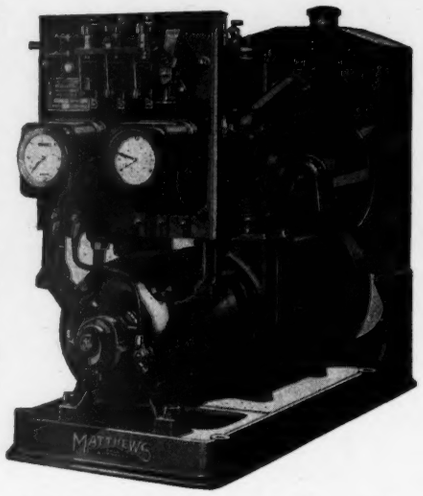


Kewanee Semi-Automatic Light and Water System.

it possible with this rheostat, during the early part of the period, to charge the batteries at double the normal rate. This reduces the length of the charging time and obtains a high degree of efficiency, according to the statements made. By reducing the electrical load with this rheostat during the charging period more power can be obtained from the engine when necessary for driving other machinery from the belt pulley. The Kewanee light and power plant is semi-automatic. It is started by pressing a button on the switchboard and is stopped in the same manner.

Individual Lighting and Power Unit With 4-Cycle Engine.

Matthews plants, marketed by the Consolidated Utilities Corp., 730 South Michigan avenue, Chicago, are made in sizes from 300 watts to 25 kw. All are rated strictly upon the output of generator without reference to battery. They are direct connected and engine-driven, the engines being uniformly 4-cycle and water-cooled. General Electric Co. generators are used. Their special features are simple switchboard control to provide full-automatic operation. When 15% of the battery capacity has been used in any manner the plant will start without attention and recharge the battery. Likewise, if any demand for current occurs which is an overload for the battery the plant will start without attention and carry the load direct from the generator, leaving the battery in reserve and not using it for such loads. This full-automatic control is accomplished through devices mounted upon



Model JR-1 Kw. Matthews Farm Electric Plant.

the switchboard which operate without the owner's care or supervision.

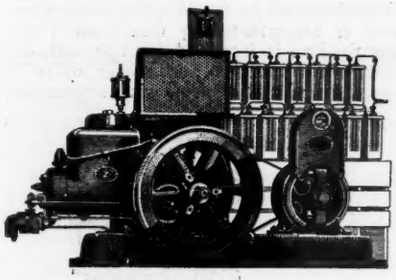
Automatic chokers provide for easy starting. Sensitive electromagnetic governors regulate speed as required for varying loads or battery charging. All plants are fitted with carburetors and Stewart vacuum systems, and the main switches are fused. The 3-wire system provides separate circuits for light and power if desired, and the consequent ability to furnish slightly higher voltage on power circuits, as well as to eliminate the effect on lights when power devices are connected in their circuits. All generators provide higher voltage at normal speed for battery charging, the voltage to light circuits being controlled by a special commutator or by a counter cell to protect lamps against burning out. If for any reason, such as lack of fuel or cracked spark plug, the plant cannot start automatically a circuit-breaker is "kicked out," thus notifying the owner and guarding against battery exhaustion.

Matthews plants have been manufactured continually with full-automatic control for 8 yrs., and they are furnished in different voltages. Specially designed types are produced for marine installation in boats, cruisers and ships where space is limited and special objects are to be attained. Certain sizes are also designed for use in mines, quarries and construction work where portable features are important in a self-contained unit.

Features of Fairbanks-Morse Home Light Plant.

The home light plant manufactured by Fairbanks, Morse & Co., Inc., 900 South Wabash avenue, Chicago, and shown in the accompanying illustration, is a belted plant consisting of a slow speed "Z" engine driving a ball bearing dynamo, both mounted on a single cast iron subbase. The engine uses either kerosene or gasoline, has high-tension ignition and is equipped with power pulley for driving other machines either while the battery is charging or as a separate full load. The engine is water cooled, for

which purpose liberal space is provided around the cylinder and valve. A condensing radiator mounted over the crank case draws off the vapor from the inclosed hopper, condensing it to water and returning it to the hopper without appreciable loss so that no frequent fill-



Fairbanks-Morse Home Light Plant.

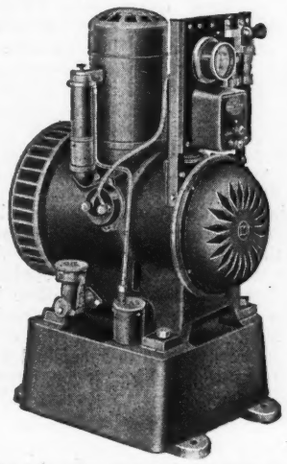
ing of the hopper is necessary. There is thus no steam formed in the room where the plant is working. The dynamo is ball bearing, which reduces friction and increases the efficiency.

The 16-cell Fairbanks-Morse Gould battery is liberal in design and is rated on the 8-hr. continuous discharge basis. A protective fuse for the battery is mounted on the rear of the panel, also an automatic cutout which makes it impossible for the battery to discharge through the generator and waste its charge when the engine is not running. The plant has a push-button start and is a compact, complete, self-contained unit that requires small space and little attention.

"D-Light" Electrical Systems Made in Three Sizes.

The "D-Light" plant manufactured by H. C. Dodge, Inc., 32 Alger street, Boston, is a complete electric lighting unit, compact, dependable and reliable. The dynamo which generates the current to charge the battery is of the 4-pole, shunt-wound type, driven by a gasoline engine. The armature is directly connected to the crankshaft of the engine. The manufacturer states that the keynote of "D-Light" success has been dependability. Every effort in both design and manufacture has been directed toward making a plant that would prove reliable. Actual service has confirmed this point and the company is now offering the "D-Light" electrical systems to the trade in three sizes, ranging from 350 to 1500 watts. The units are rugged and attractive in appearance, quiet in operation and are free from harmful vibration. The systems generate at 32 volts and are semi-automatic in operation. The general specifications of the 1500-watt, 32-volt "D-Light" plant are as follows:

Engine—Single cylinder, vertical 4-cycle, air cooled, 3.5 hp., 1200 r.p.m., 4-in. power pulley. *Cylinder*—Detachable head, 1.5 diam., alley valves ⅜-in. stem, with pressed in castiron guides. Cylinder body, castiron with vertical cooling fins 3.25-in. bore by 5-in. stroke. Heat treated and ground. *Piston*—Lightweight castiron, 3 rings, ground, hollow pin. *Crankshaft*—Drop forged, counterbalanced, running on heavy duty type ball bearings. *Camshaft*—drop forged, case hardened. *Connecting Rod*—Drop forged, white metal crank pin bearing lining 2 by 1⅞ ins., wrist pin bearing, bronze ⅞-in. diam. *Flywheel*—Castiron, balanced, suction cooling vanes cast integral with wheel. Power pulley. *Gasoline Tank*—Galvanized, 3-gal. capacity, welded joints equipped with safety type filler, located in base of engine casting. *Ignition*—Battery and generator ignition from high-tension coil, impulse spark breaker, ⅞ in. long S. A. E. spark plug. *Lubrication*—Constant level splash system, positive drive plunger pump. *Control*—Push button, self-starting from battery. Automobile centrifugal throttling governor. *Fuel*—Gasoline or kerosene. *Carburetor*—Designed especially for this plant, adjustable speed, with automatic throttle control. *Generating Plant*—Single unit, direct connected, net weight, 525 lbs., shipping weight 600 lbs. *Overall Dimensions*—23 by 32 by 38 ins. high. *Switchboard*—Panelboard black asbestos, equipped with load and line fuses, two double pole-knife switches, ammeter, automatic switch and rating plate. *Generator*—4-pole, shunt wound with series field for starting duty; 1500 watts 36 volts 42 amperes; 1200 r.p.m. 40 deg. rise full load. Lamp capacity sixty-five 20-watt lamps; will run a 1-hp. motor. *Battery*—L-1500-1 100 ampere-hrs. at 8 hrs. continuous discharge rate; 16 cells assembled in sealed glass jars charged ready for use; lamp capacity twenty 20-watt lamps; capacity of generator and

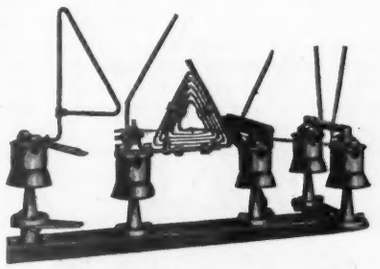


The Dodge 350-Watt "D-Light" Generating Unit.

battery combined eighty-five 20-watt lamps; watt hours 3200, based on 8-hr. rate; weight, net 600 lbs., packed 740 lbs. L-1400-4 120 ampere-hrs. at 8 hrs. continuous discharge rate; 16 cells assembled in sealed glass jars charged ready for use; lamp capacity 25 deg. 20-watt lamps; capacity of generator and battery combined ninety 20-watt lamps; watt hours 3840, based on 8-hr. rate; weight net 650 lbs., packed 800 lbs. L-1500-7 ampere-hrs. at 8 hrs. continuous discharge rate; 16 cells assembled in sealed glass jars charged ready for use; lamp capacity thirty-three 20-watt lamps; capacity of generator and battery combined one hundred 20-watt lamps; watt hours 5120, based on 8-hr. rate; weight net 800 lbs., packed 960 lbs. *Color*—Black enamel, nickel trimmings.

Unit-Type Equipment for Farm Line Service.

The Railway & Industrial Engineering Co., Greensburg, Pa., has recently developed and placed on the market a farm-line equipment, some of the interesting features of which are a horn-gap switch, triangular choke coil, lightning arrester and horn-gap fuse. All of these parts are combined as a single unit on one base, making a compact and complete single-pole equipment. Two single-pole units are mounted on one set of crossarms, the transformer being also mounted on the same crossarms. Mini-



Switching Unit for Use on Farm Service Lines.

mum gaining and drilling of the pole is required, the arrangement throughout making it possible to install the complete equipment with a minimum amount of field work.

The air-brake switch is equipped with arcing horns protecting the main contact, which is covered by a sleet hood from all arcing or burning. The switch is mechanically interlocked for simultaneous operation by a single operating handle placed on the pole within easy reach from the ground. The operating handle can be locked in open or closed position. The choke coil is of the triangular type and is combined with the lightning arrester, forming a straightline discharge path for surges. A resistance unit is permanently connected in the ground side of the lightning arrester to limit the flow of dynamic current on a discharge. The fuse is of the reliable horn-gap type and is provided with a glass cartridge link.

Lalley Light and Power Plant for Rural Service.

The new Lalley light and power plant for the farm is illustrated and described in a recent folder issued by the Lalley Light Corp. of Detroit. It is stated that the Lalley plant has only three moving parts; is equipped with ball bearings and a special design of generator which insures long battery life and battery service. The specifications of the new Lalley light and power plant are as follows:

Engine—2.5 hp., 2⅝ bore by 2-in. stroke; special Lalley design of the 2-cycle type, water cooled, thermosyphon system; only three moving parts. *Ignition*—Atwater-Kent dual generator-battery ignition, especially designed for Lalley engines; efficient, positive and proved reliable after long use. *Governor*—Lalley design of the flyball type; automatically maintains engine at constant speed, regardless of line load. *Switchboard*—Carries all switches and fuses for full protection of generator; also ampere-hour meter and central switch; all parts neatly inclosed, but accessible. *Starting and Stopping Switch*—Sturdy, dependable, designed especially for the new Lalley light by the Cutler-Hammer Manufacturing Co. *Automatic Features*—Plant starts with pressing a button; stops automatically when battery is fully charged, otherwise stops with pulling of switch. *Batteries*—16-cell, 32-volt sealed glass jar battery, with suspended plates, giving increased sediment space; charge and discharge operation automatically controlled.

Individual Lighting and Power Unit with Cover.

The "Simplex Aurora," an individual light and power unit, is being manufactured by the Simplex Utilities Corp., 360 Madison avenue, New York City. The first impression of the plant is one of neatness and compactness, all moving parts being covered. This is accomplished without sacrifice to accessibility. Removal of the engine-end cover pro-

"Simplex Aurora" Lighting Unit With Automatic Control.

vides access to engine parts. The generator brushes and commutator are reached by removing a hand hole cover on the generator end of the unit.

It is a fully automatic 32-volt, 1.5-kw. plant with storage batteries. The automatic features are based on principles which insure long life to the weakest part of a lighting outfit, namely, the batteries. The control automatically starts the plant when the batteries have reached a determined point of discharge, and stops it when the batteries are fully charged. A hydrometer suspended in the pilot cell which is of the same size and capacity as the other cells imparts motion to the walking beam, carrying it up or down by the rise and fall of the hydrometer bulb with the varying gravity of the electrolyte. This walking beam makes and breaks contacts carrying only a minute current to operate a polarized relay in the control, which starts a small motor which revolves a shaft on which is set rotary switches starting the generator as a motor to crank the gasoline engine. This control of the plant by the real test for the condition of the batteries—the specific gravity—eliminates the chance of charging or discharging the batteries beyond set limits. The entire automatic mechanism is inclosed in a small metal case, and as it is entirely self-operating there is no occasion for the owner to open it up or do anything to it.

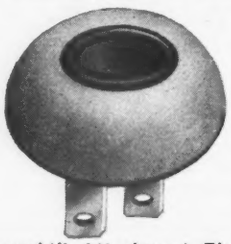
A special arrangement prevents the batteries from carrying overloads. When the load exceeds the 8-hr. discharge rate of the batteries the plant is automatically started up so that the generator may "slip in" and supply the load. This is accomplished by a capacity-load solenoid operating a second polarized relay which starts the small motor revolving the shaft of rotary switches. Thus, with the hydrometer keeping the batteries within set limits of charge and discharge, and the overload feature preventing the 8-hr. discharge rate from being exceeded, the batteries are under full supervision. This, of course, eliminates a long chapter of trouble from overcharging, discharge to a point where lights are dim, buckling of plates, and deposit of sediment from high discharge rates. The batteries themselves have been selected with a view to long life and efficiency. An overcharge switch enables the batteries to be given a soaking charge once a month to bring the gravity of the cells together and to increase their life.

One of the important points of the system is the trouble feature which operates from a reverse-current relay. Any trouble which would cause the engine to fall below speed will automatically shut the plant down, light a red light and ring a bell. This makes the plant practically fool-proof, as the warning signal continues until the trouble has been corrected. With the above automatic features the care of the plant is reduced to keeping the engine supplied with oil and gasoline. Neglect of either of these will cause the plant to shut down and display the warning signal.

The generator is a 4-pole compound-wound machine of General Electric make with characteristic to conform to battery requirements. The gasoline engine is a specially designed 2-cycle, single cylinder, air cooled machine running 900 r.p.m. The 2-cycle engine eliminates all valve gear and grinding of valves. The armature of the generator being on the crankshaft, makes but three principal moving parts—connecting rod, crankshaft and piston. The crankcase is specially designed to insure accessibility with gas-tight connections. A 2-plunger walking-beam pump supplies oil to bearing surfaces and gasoline to a floatless carburetor, both gas and oil tanks being in the base of the engine. High-tension ignition is furnished by the Philbrin system. The cover over the end of the shaft may be taken off and a pulley attached.

A New Nonbreakable Attachment Plug Cap.

Attachment plug caps used on such devices as flatirons, washing machines, vacuum cleaners, electric drills, etc.,



"Dreadnaught" Attachment Plug Cap.

are frequently and annoyingly broken and the device put out of service. To eliminate this source of trouble and expense the specialty and switch department of the Cutler-Hammer Manufacturing Co., Milwaukee, has brought out a steel-clad cap which is exactly like the standard cap (fitting all plugs and receptacles of standard design), with a protecting jacket of steel.

This cap, called the "Dreadnaught," was brought out through the request of an appliance manufacturer who realized that such minor troubles as broken caps often reflect adversely on the appliance itself.

Power Stand for Use With Low-Voltage Service.

The 32-volt portable power stand, manufactured by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is intended for use with 32-volt farm lighting and power units to operate such devices as separators,

Portable Power Stand Suitable for Use on the Farm.

churns, washing machines, grindstones, feed mills, and other devices. The stand consists of the 0.25-hp., compound-wound motor mounted on a substantial tripod. The speed of the armature shaft is 2100 r.p.m., and that of the back-gear shaft is 250 r.p.m. A 6.625-in. flat-faced pulley and a 2.75-in. grooved pulley are permanently attached to the slow speed shaft. The entire stand is 27 ins. high. The portable power stand is very simple to operate and can be connected to any light socket and easily belted to many appliances. This unit makes possible the use of electric power for many applications on farms which have 32-volt light and power plants.

New Paste for Soldering Small Wires.

A new soldering paste is being marketed by the Killark Electric Manufacturing Co., 3940 Easton avenue, St. Louis. This soldering paste is new commercially but has long been in successful use at the Killark factory where a great deal of very fine soldering of small wires is done in the manufacture of electric fuses. It was the company's inability to obtain a commercial soldering paste suitable for its needs that led it into extensive experimenting and produced the product now being marketed by the Killark concern.

Common with other soldering pastes it uses a zinc salt as one of the active ingredients. However, a zinc salt even in the presence of air only will frequently form hydro-chloride acid with resulting corrosion. In this, it is stated, Killark soldering paste differs from all others. By the addition of a new ingredient any free acid which may be formed is immediately reduced back to an active ingredient, the result being a soldering paste with new and distinct advantages.

ACTIVITIES IN THE TRADE

Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests

Quaker City Furnace & Supply Co., is the new name of the Quaker City Furnace Co., Philadelphia.

Chesapeake Electric Co., 205 North Calvert street, Baltimore, has filed notice of increase in its capital stock to $50,000.

Union Steam Pump Co., of Battle Creek, Mich., has opened a branch office at 2115 L. C. Smith building, Seattle, Wash.

Pittsburgh Gas & Electric Fixture Co., Philadelphia, has leased property at 22 South Fifth street for a new local establishment.

London Lightingwares Corp., 583-87 Broadway, New York City, sustained a loss by fire recently when some of its property burned.

Starlight Electric Co., Des Moines, Ia., with G. H. Lieber, manager, has begun business specializing in electrical work on automobiles.

Orton & Steinbrenner Co., Chicago, has put out a new catalog, No. 19, describing its line of coal crushers and giving some information also on its locomotive cranes.

American Bell Telephone Co., Boston, a state corporation, has filed notice of dissolution. The company is capitalized at $26,015,000, and has been inactive for a considerable period.

Manhattan Refrigerating Co., Gansevoort and West streets, New York City, has acquired property at 808-10 Washington street, and is reported to be planning the erection of a plant.

Vogt Bros. Mfg. Co., Louisville, Ky., has recently issued a bulletin entitled, "Vogt Bros.' Hand Stoker." The bulletin gives details and an illustrated description of the stoker with data on its performance.

Cutter Electrical & Manufacturing Co., Philadelphia, manufacturer of flush switches, circuit-breakers, etc., has acquired the 4-story factory at 19th and Hamilton streets, now occupied under lease, 75 by 196 ft., for a consideration of about $150,000.

Ohio Generating Co., Red Lion, Pa., recently organized, has plans under way for the erection of a local plant for the manufacture of electric lighting plants and systems for rural and farm service. C. S. LaMotte is president.

S. Flory Manufacturing Co., Bangor, Pa., has recently issued a 16-page booklet illustrating and describing hand, steam and electric capstans. Specifications of the various types are given in connection with details of each.

National Pressed Steel Co., Massillon, O., has issued the second edition of the National steel lumber handbook. This is a 183-page cloth bound manual. It has been prepared by the steel lumber division of the company under the direction of H. M. Naugle and Stanley Macomber. It follows the lines of the first edition and contains the sort of data the designers of ordinary steel work are accustomed to find in the various well-known structural-steel handbooks. Since the first edition was published there have been a number of improvements in the product and some changes in the design of National sections. The new edition covers these developments and amplifies in many respects the contents of the first edition. In addition to the information essential in such a handbook regarding the properties of the sections, details in connections, etc.—there is considerable auxiliary material in the way of comparisons of cost of designs, using steel lumber with other well known types of construction, data on footing designs, loads permitted by building ordinances, etc.

Harsman Electric Co. Havana, Ill., has been awarded the contract for the new plant of the South Pekin Light, Heat & Power Co. The work consists of building a trunk line from the Rocky Ford pumping station to South Pekin.

General Electric Co., Pittsfield, Mass., will soon commence work at its local plant for the manufacture of electrical equipment for the Japanese Government, contract for which, said to total about $200,000, recently was secured.

E. & G. Brooke Iron Co., Birdsboro, Pa., is planning the construction of an electrically-operated aerial cable line from its iron ore properties in the French Creek section to its local blast furnaces, a distance of about 10 mi. Metal ore buckets will be arranged with pulleys hung from a cable, and each provided with an electric motor.

Kewanee Boiler Co., Kewanee, Ill., reports that it has experienced a noticeable increase in volume of business transacted the past few months. During the past year three cuts in prices of Kewanee steel firebox boilers have been made and because of the reduction of costs due to volume of business another drop in price was announced Sept. 26, this making the fourth this year.

Prescott Co., Menominee, Mich., has issued a 60-page booklet illustrating and describing its line of electric mine pumps. The booklet goes into detail as to the advantages of electrically operated pumping equipment, several sizes and types of pumps being described. While the booklet primarily is devoted to describing electrical equipment, one section covers steam operated equipment.

Crane Co., Davenport, Ia., has awarded the contract for an $85,000 factory building to the Priester Construction Co. The Tri-City Electric Co. of Davenport has the contract for the wiring. Machinery will be installed in the new building by the Sanders Co. of Philadelphia. Clausen and Kruse, Davenport, architects, have drawn up the plans for the building. When completed, this building will give the Crane Co. real estate in Davenport worth $160,000. The company has recently opened up new branch offices at Cedar Rapids, Iowa, and Galesburg, Ill.

Morgan-Gerrish Co., 501 South 6th street, Minneapolis, has announced that L. L. Smith, formerly Minneapolis branch manager of the Under-Feed Stoker Co., of America, is now associated with it. Mr. Smith will continue to represent, through the Morgan-Gerrish Co., the Under-Feed Stoker Co., of America, as well as several other manufacturers of allied lines of power-plant equipment.

Witherbee Storage Battery Co., 649 West 43d street, New York City, is planning the immediate extension and improvement of the plant of the United Filters Corp., 355-73 Cortlandt street, Belleville section, Newark, N. J., recently acquired, with view to early occupancy. The property totals 150 by 200 ft., and is improved with a 2-story brick building and power house. It will be equipped by the new owner for the manufacture of storage batteries.

Blaw-Knox Co., Pittsburgh, occupied Booth No. 716 in the National Exposition of Chemical Industries held recently in the Eighth Regiment Armory, New York City. The company exhibited samples of forge and hammer welded steel plate work, operating models of Blaw clam shell buckets and sample Blaw-Knox Prudential sectional steel building, also photographs of various other products, including blawforms, structural steel buildings, transmission towers, water cooled furnace appliances and miscellaneous steel plate work.

Galland-Henning Manufacturing Co., Milwaukee, manufacturer of electric and hydraulic baling presses for metals, rags, paper and other waste products, accumlators, pumps, valves and hydraulic production presses, has recently reorganized and increased its sales engineering department. N. W. LeVally and H. C. Norman, Milwaukee; P. H. Arden, Chicago; S. W. West, Cleveland, and John F. Willard, Los Angeles, formerly connected with Logemann Brothers Co., are now affiliated with the Galland-Henning Manufacturing Co. Mr. LeVally as general and sales manager and Mr. Norman as assistant sales manager will be located in the general offices in Milwaukee. Mr. Arden will be located in Chicago; Mr. West in Cleveland, and Mr. Willard in Los Angeles, as sales engineers in their respective districts. R. O'Donnell will be located in New York as sales engineer for the New York district.

PERSONAL MENTION

Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry

W. F. ABEL has been appointed assistant general manager of sales for the Electric Alloy Steel Co., Youngstown, O.

GEORGE SHORTMEIER has been appointed manager of the New York branch of the American Bosch Magneto Corp. of Springfield, Mass., to succeed O. S. Stanley.

W. H. R. BURROWS, formerly with the Wabi Iron Works, New Liskeard, Ont., is now general manager of the Canada Electric Castings Co., Ltd., Orillia, Ont.

L. EDWARD HERMANN, counsel for the Board of Public Utility Commissions, Trenton, N. J., has tendered his resignation, requesting that it be accepted at an early date.

ROBERT LINDSAY, who has been vice-president and general manager of the Cleveland Electric Illuminating Co., Cleveland, was recently elected president of the company.

FRED E. DACE, formerly with the Holt Manufacturing Co., Peoria, Ill., has accepted a position as instructor in electricity and mathematics at Bradley Polytechnic Institute, Peoria.

FRED V. BENZ, purchasing agent of the Milwaukee (Wis.) Electric Railway & Light Co., has been elected president of the Milwaukee Society of the National Association of Purchasing Agents.

JOHN W. CARROTHERS, formerly connected with Hans von Unwerth, consulting engineer, Kansas City, Mo., has accepted a position as voltage operator with the Kansas City Power & Light Co.

J. A. WOIDILL, JR., formerly electrical chief draftsman of the Hog Island shipyard, has become superintendent of the Atlantic County Electric Co. and Enterprise Gas Co., Egg Harbor City, N. J.

C. F. BACKSTRAND, formerly assistant district manager of the Holton Power Co., El Centro, Cal., is now associated with Howard F. Ross in the Riverside (Cal.) Electric Co., electrical contractor and engineer.

JOSEPH B. GREGG, advertising manager for Thomas A. Edison, Inc., West Orange, N. J., has resigned. He was the recipient of a diamond ring from his associates, given at a farewell dinner at Achtel Stetters', Newark, N. J., Oct. 10.

J. E. BARRON has been appointed sales manager of the Western Electric Co. at Indianapolis to succeed C. E. Roberts, who was transferred to Chicago. Mr. Barron joined the Western Electric organization as a salesman at Chicago in 1915.

DR. WALTER E. BOVERI, of the Swiss electrical engineering firm of Brown, Boveri & Cie, arrived in New York City this month. His headquarters while in this country will be with the Scintilla Magneto Co., 225 West 57th street, New York City.

A. L. HADIN, recently appointed chief engineer of the Calumet Station of the Commonwealth Edison Co., Chicago, has been relieved of the title of chief engineer of railway power stations. George Brodie is appointed to the position vacated by Mr. Hadin and is given the title of chief engineer of Stations Nos. 10, 11 and 12.

E. L. CALLAHAN has been appointed sales manager of the Westinghouse Lamp Co., with headquarters at 165 Broadway, New York City, to succeed

E. L. Callahan.

Elliot Reid, who has resigned. Mr. Callahan has represented the company as district manager at the Chicago office for 6.5 yrs., prior to which time, for 6 yrs., he directed the activities of the new business department of H. M. Byllesby & Co., Chicago. Mr. Callahan is well known in the electrical industry throughout the country and has had a long and varied experience. An alumnus of the Case School of Applied Science (class of 1900), where he received the Bachelor of Science and Electrical Engineer's degrees, immediately on leaving college he received a commission in the War Department as electrical expert, assigned to work in connection with a proposed submarine cable from Nome to St. Michael's, Alaska. His later experience was with the Westinghouse, Church, Kerr Co., assisting in the preliminary work on the electrification of the Pennsylvania railroad terminals in and near New York City, after which he entered the appliance branch of the industry as assistant manager of the Simplex Heating Co. of Boston, later becoming manager of the heating department, General Electric Co., Chicago. His activities in the industry were such that he was made chairman of the Commercial Section of the National Electric Light Association, having been one of the founders of the section. Mr. Callahan is a member of the Electric Club of Chicago, the Oak Park Country Club, Oak Park, Ill., the Oak Park Lodge of Elks, and of the Masonic Order.

OBITUARY.

JOHN HAZARD GALLAWAY, superintendent of construction for the Nassau & Suffolk Lighting Co., Mineola, L. I., died in that city on Oct. 12, aged 52 yrs.

JOHN G. LUKE, president of the West Virginia Paper & Pulp Co., New York City, died Oct. 15, aged 64 yrs. After serving as superintendent of various paper mills he organized his own company and built a mill at Piedmont, W. Va., to make sulphite pulp. This business grew from 12 tons of pulp a day in 1889 to a daily output of 650 tons of book paper at the present time.

DAVID F. HENRY, Pittsburgh, a pioneer in electrical and industrial circles in that vicinity, died Oct. 12 in his apartments at Hotel Henry, which he owned, at the age of 85 yrs. He introduced the first telephones in Pittsburgh, having been instrumental in organizing the Central District & Printing Telegraph Co. in 1878, now the Bell system. He was vice-president and general manager of that company until 1902. He organized the Pleasant Valley street railway into an electrically operated system in 1889, said to be one of the first successful traction lines in the country.

DR. JOSEPH W. RICHARDS, professor of metallurgy at Lehigh University, Bethlehem, Pa., died Oct. 13 at the age of 57 yrs. He was recognized as one of the foremost chemical engineers and metallurgists of the country and was an authority on aluminum. In 1902, when the American Electrochemical Society was formed, he was active in its organization and became its first president. At his death he was secretary of the Society, which position he had held for several years. Professor Richards was a member of the American Institute of Mining and Metallurgical Engineers and other technical associations.

WINTHROP G. BUSHNELL, electrical engineer, whose father, Cornelius S. Bushnell, financed the building of the U. S. gunboat *Monitor*, died in New Haven, Conn., Sunday, Oct. 23, of heart disease. He was 57 yrs. old and graduated from Yale in 1888. For 30 yrs. he had been active in the development of public utilities, particularly in Connecticut. He merged the New Milford Power Co. and the Falls Village Water Power Co. into the Connecticut Power Co., which supplies cities of the state with electricity, and bought and developed the Camaguey Power Co. in Cuba. He was a director of the Delaware Aircraft Co. In the world war Mr. Bushnell served as state chairman of the United War Work Campaign. He is survived by his wife, daughter of the late Capt. L. T. Scofield, of Cleveland, and two children.

BUSINESS OPPORTUNITIES

News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies

EASTERN STATES.

Boston, Mass.—The Liberty Laundry Co. will make extensions and improvements in the power house at its mechanical laundry plant on Newbury street, near Massachusetts avenue.

New Bedford, Mass.—New Bedford Gas & Edison Light Co. has arranged for a stock issue of $150,000, the proceeds to be used for general operations, extensions, improvements, etc.

Long Island City, N. Y.—Considerable electrical equipment will be installed in the celluloid specialty manufacturing plant to be established by A. L. Reade & Co., Inc., 141 West 36th street, New York City, in the new building now being erected on Ely avenue, near the Bridge Plaza, recently secured under lease.

New York, N. Y.—James A. Hearn & Sons, 8 West 14th street, operating a department store, have filed plans for extensions and improvements in their power house on West 13th street.

New York, N. Y.—The Department of Water Supply, Gas & Electricity has filed a request with the Committee on Finance and Budget, Board of Estimate, for an appropriation of $4,548,455 for the coming year, for operations, extensions, etc. For the closing fiscal period the department was allowed $4,469,493.

Jersey City, N. J.—Brunswick Laundry, Inc., 222 Tonnelle avenue, has awarded a contract to James Mitchell, Inc., 76 Montgomery street, for the erection of a 1-story power house at its mechanical laundry plant.

Trenton, N. J.—The City Commission is negotiating with the Trenton & Mercer County Traction Co. for the replacing of its present overhead lines with an underground system in certain parts of the city. Investigations will be made of present underground line installations at New York City and Philadelphia.

Carlisle, Pa.—The Chamber of Commerce plans to have a new system of street lighting installed on eight blocks in the central business section. Address the mayor.

Harrisburg, Pa.—The State Police Department is planning the installation of a wireless telephone system in the Capitol for communication with all police barracks in the state, where similar installations will be made, and certain municipal police departments.

Harrisburg, Pa.—Harisburg Light & Power Co. will construct a new intake for its electric generating plant at the mouth of Spring creek.

Harrisburg, Pa.—The Harrisburg Railways Co. will make extensions and improvements in its electric power plant on South Cameron street, to cost about $75,000. New boilers, stokers, electrical and other operating equipment will be installed.

Huntington, Pa.—Cove Electric Co., Roaring Spring Light, Heat & Power Co., and the North Woodberry Electric Co. have been consolidated with the authority of the Public Service Commission. The new organization will operate under the name of the first noted company. The different systems will be tied in, and extensive additions and improvements are planned. Warren I. Simpson is treasurer.

Northampton, Pa.— Northampton Transit Co. has made application to the Public Service Commission for permission to reorganize under the name of the Northampton Traction Co.

Philadelphia, Pa.—The Water Bureau will make improvements and extensions in the electrically operated pumping station for the waterworks department at Lardners' Point.

Pittsburgh, Pa.—Electrical equipment, including motors, controlling apparatus, etc., will be installed in the cold storage plant to be constructed by the North Pole Ice Co., at 12th and West Carson streets. Plans for erection have just been filed. The new plant will cost about $400,000.

Pottsville, Pa.—Eastern Pennsylvania Light, Heat & Power Co., South Centre street, has made application to the Public Service Commission for permission to install and operate a system in certain sections of Schuylkill county.

Cumberland, Md. — Considerable electrical equipment will be installed in the automobile manufacturing plant now being erected by the Paragon Motor Co., First National bank building, on a local site, estimated to cost $200,000. Philip W. Blake is president.

Hagerstown, Md.—Hagerstown & Frederick Railway Co. has made application to the Public Service Commission to arrange a bond issue, the proceeds to be used for general operations, financing, improvements, etc.

Washington, D. C.—Washington Rapid Transit Co. has filed notice of increase in its capital stock from $300,000 to $500,000, the proceeds to be used for general operations, improvements, etc.

Brunswick, Ga.—Brunswick Interurban Railroad Co. has applied for a charter to rehabilitate and operate a trolley system here with a capital stock of $50,000. George C. Smith, C. W. Irwin, R. A. Gould and others are interested.

Savannah, Ga.—Savannah Electric Co. has been reorganized under state laws with a new company to be known as the Savannah Electric & Power Co. All properties of the former company will be taken over by the new organization, subject to outstanding bonds totaling $3,147,000. The new company has arranged for a bond issue of $1,750,000. The properties will be continued under the management of Stone & Webster, Inc.

Tampa, Fla.—Residents along the proposed lines have signed a petition for an extension of the municipally-owned lines of the Lakeland light and water plant from Lakeland City limits to Lakeland Highlands, a distance of 8 mi. Address the mayor.

NORTH CENTRAL STATES.

Canton, O.—Canton Oxygen Co. will begin work at once on the $20,000 plant to be erected on the Stolzenbach farm. Address W. L. Stolzenbach, director.

Galion, O.—The question of issuing $125,000 bonds for the rehabilitation of the municipal electric light plant will be submitted to the voters at the November election. Address city clerk.

Steubenville, O.—Ohio Power Co. is planning to spend $50,000 in the erection of a new substation. Address manager of the company.

Zanesville, O.—Plans are being prepared for the enlargement of the Ohio Bell Telephone Co.'s building to care for the business when merger of present two companies takes place. A new power plant will occupy the basement of the building.

Dimondale, Mich.—An election will be held to vote on the question of issuing $13,000 worth of municipal light bonds. Address the mayor.

Hillman, Mich.—The hydroelectric power station was destroyed by fire. Address Paul Elowski, owner.

North Muskegon, Mich. — Plans have been prepared and an election will probably be held to vote on the question of issuing bonds for the purpose of providing electricity and electrifying this city. Another plan is to raise $35,000 by the purchase of stock of the Consumers Power Co. Address Mayor Castenholz.

Indianapolis, Ind.—The Board of Public Works has been petitioned for additional lamps on North Illinois street. Address city clerk.

Mooresville, Ind.—Indiana Public Service Commission has authorized the Interstate Public Service Co. to purchase the electric distribution system owned by Mooreseville. The company will then be in complete charge of the electric service in the community. The sale was made in order to give better service. Kilmer Brothers, operators of an electrical distribution system at Blountsville, has requested the commission to discontinue the plant. Current for the town if the Kilmer plant is closed is to come from a nearby transmission line.

Atlanta, Ill.—Atlanta Electric Light & Power Co. recently filed an appli-

cation for permission to construct and operate an electric transmission line between Lincoln and Atlanta and to issue $35,000 worth of first mortgage bonds.

Brownstown, Ill.—An election will be held to vote on the question of issuing $8000 for the construction of a public utility to be used for the transmission of electric current from the city of Vandalia to this village and for the purpose of lighting the public streets and alleys. Address the village mayor.

Canton, Ill.—Canton Gas & Electric Co. is extending its steam heat lines on West Elm street.

Chicago, Ill.—Bids were received Oct. 27 for the furnishing of wire and cable, cable clamps, fiber conduit, crossarms, etc., to the city of Chicago, Department of Gas and Electricity.

Havana, Ill.—Bids were received Oct. 28 for the furnishing of 1716 linear ft. of high-tension transmission line; 3510 linear ft. submarine cable, 9 lightning arresters, etc., by the Chautauqua Drainage and Levee District. Address Charles E. Walsh.

Springfield, Ill.—The Utilities Co. and the City are planning $3,000,000 worth of improvements to be started in the near future. These will include new pavements, construction of underground conduit for electric light and power wires, new sewers, ornamental lighting systems and the purchase of the Fourth street lighting system by the city, as well as a number of minor improvements. Address A. C. Mackie, manager.

Dodgeville, Wis.—Wisconsin Light & Power Co. has secured property on East Division street as a site for the sub-station of the company in this city. Address manager of the company.

Sturgeon Bay, Wis.—Definite action on the installation of an ornamental lighting system and the removing of the telephone and electric light poles from the streets will be started at once. Address the city clerk.

Barnesville, Minn.—The city electric lighting system will be improved. Address E. Aamoot, city clerk.

Bronson, Minn.—Plans are being prepared for the erection of a power plant. Address E. F. Behrendt, Foley, Minn.

Eveleth, Minn.—A "white way" will be constructed from Grafield street to Adams avenue. Address A. J. Buskick, city clerk.

Neodesha, Kan.—Light and water bonds amounting to $195,000 have been voted. The plan is to install new engines in the power plant, replacing the present steam plant with oil engines and motor driven pumps. A "white way" will be built on two of the principal streets. Address the mayor.

Madison, Neb.—An election will be held Nov. 15 to vote on the question of issuing $40,000 in bonds for improvements to the electric light plant. Address the mayor.

Nemara City, Neb.—The transmission line from Shubert will be extended to furnish electric power and light. Address the city clerk.

SOUTH CENTRAL STATES.

Billings, Okla.—The Common Council has authorized the immediate construction of the proposed transmission line from Oklahoma City to Billings for municipal electric supply.

El Reno, Okla.—Oklahoma Power & Transmission Co. is arranging the immediate disposal of $150,000 of a $450,000 bond issue, as recently voted, for general operations, expansion, etc. The company is managed by the William A. Baehr organization, Peoples Gas building, Chicago.

Wilson, Okla.—The Common Council is perfecting plans for a bond issue of $70,000, for extensions in the municipal electric lighting plant and system.

Cameron, Tex.—An election will be held to vote on the question of issuing $250,000 worth of electric light, sewage disposal and water bonds. Address Engineer Service Co., consulting engineer, Sumpter building, Dallas, Tex.

Edinburg, Tex.—Bids were received Oct. 20 for the erection of a city waterworks and lighting plant. Address City Engineer Wilcox.

Mexia, Tex.—A power plant will be constructed by the Mexia Refining Co., Telephone Exchange building, in connection with its proposed new local oil refinery, estimated to cost $250,000. Considerable electrical equipment will be installed in other works departments.

San Angelo, Tex.—Interstate Electric Corp. of New York may entertain the proposal to sell its water, light and power plant to San Angelo; however, agitation for building a new system has recently developed. Address R. H. Henderson, city manager.

San Antonio, Tex.—Gulf Coast Power Co. has been organized with a capital of $100,000 to operate an electric light and power system in the vicinity of Corpus Christi, Tex. The company is headed by C. M. Dickson and Marshall Hicks, both of San Antonio.

Slaton, Tex. — Slaton Light & Power Co. has increased its capital stock to $25,000 for proposed expansion.

Slaton, Tex.—Plans are being prepared to install new squipment in the local sewer and lighting plant to increase the capacity of the plant. Address the mayor.

Timpson, Tex. — The Common Council has arranged for a bond issue of $30,000 for the installation of an electric lighting plant.

Whitney, Tex. — The Common Council has awarded a contract to W. T. Barton, Whitney, for the construction of a municipal electric power plant. Work will be commenced at once. W. D. Nuckols, mayor, is in charge.

Wortham, Tex.—A Dallas engineering company has been employed to make survey and give estimates on a water works sewerage and light system. Address the mayor.

WESTERN STATES.

Los Angeles, Cal.—The City Power Bureau has awarded a contract to the Humphrey Engineering Co., San Fernando building, for the construction of an ornamental lighting system in the Crescent Heights district.

Merced, Cal.—The Board of City Trustees has approved plans for the installation of a new electrolier lighting system on certain streets in the city.

Pasadena, Cal.—The Municipal Lighting Department has taken bids for the erection of the superstructure for the proposed addition to the municipal generating plant at Glenarm street and Raymond avenue.

San Francisco, Cal.—Lars Jorgensen, Chronicle building, and associates, have made application to the Federal Power Commission to utilize waters on the Feather river for proposed hydroelectric generating plants with total capacity of about 200,000 hp.

San Francisco, Cal.—Lars Jorgensen, 1405 Chronicle building, has applied to the Federal Power Commission for a preliminary permit covering the following project: Three major and three minor projects to be located on the middle fork of Feather river in Plumas, Sierra and Butte counties, Cal. The project contemplates the creation of six large reservoirs, storing a total of 372,000 acre-ft., the construction of several diversion dams, several miles of conduits and tunnels and six power houses. The water from the south fork and from a branch of the north fork is to be diverted into the middle fork. The total development is 200,000 hp. for public utility purposes.

San Francisco, Cal.—Southern Sierras Power Co., care W. L. Huber, First National Bank building, San Francisco, has applied to the Federal Power Commission for a preliminary permit covering a project to divert the waters of Bear creek and Santa Ana river to a power house on the latter stream in Riverside county. The proposed use is for public utility purposes.

Turlock, Cal.—The Modesto Irrigation District has had plans prepared for the construction of a power plant for the joint use of the Modesto and Turlock irrigation properties. Construction will be commenced at an early date. Percy Jones is chief engineer.

Port Snettishham, Alaska.—Frank C. Dougherty, Palace hotel, San Francisco, has applied to the Federal Power Commission for a preliminary permit covering four projects to be located at Crater, Long and Tease lakes and at Sweetheart Falls near Port Snettishham, Alaska. The total proposed development is 66,000 hp. The proposed use is for pulp and paper manufacture.

Marmora, Ont., Canada.—Pearce Co. is planning the rebuilding of the power house at its woolen mills, destroyed by fire recently.

Boquillas, Mexico.—It is planned by the Canadian Power Co. to extend its electric power transmission system from its hydroelectric plant here to a number of towns and mining districts, in addition to those already served by it. The dam which the company built across the Conchos river at Boquillas for the purpose of storing water for operating the hydroelectric

plant was finished during the early part of the revolutionary period of Mexico. The cost of the dam and plant was approximately $11,000,000 U. S. currency. Below the great water storage reservoir is approximately 200,000 acres of rich valley lands which are susceptible of reclamation by means of irrigation from the water that flows over the dam. The State and Federal governments are now considering the matter of building a system of canals and ditches to convey the water over the lands and to colonize them with farmers.

PROPOSALS.

Washington, D. C.—Sealed proposals will be opened Nov. 3 for the installation complete of the mechanical equipment for infirmary, central heating plant, power plant and outside service at the U. S. Public Health Service Hospital No. 55, at Fort Bayard, N. M., in accordance with the drawings and specification, copies of which may be had at the office of James A. Wetmore, acting supervising architect, Washington, D. C., or at the office of the superintendent at Fort Bayard, N. M.

Washington, D. C.—Sealed proposals will be opened in the office of the Treasury Department, supervising architect's office, Nov. 9, for a new conduit and wiring system at the U. S. Post Office and Court House, Philadelphia, in accordance with drawing and specifications, copies of which may be obtained from the custodian at Philadelphia, or at the office of James A. Wetmore, acting supervising architect, Washington, D. C.

Washington, D. C.—Sealed proposals will be opened in the office of the Treasury Department, supervising architect's office, Nov. 15, for furnishing lighting fixtures for the U. S. P. H. S. Hospital, Fort Mackenzie, Sheridan, Wyo., in accordance with specifications, copies of which may be obtained at the office of James A. Wetmore, acting supervising architect, Washington, D. C.

Adrian, Minn.—Bids will be received Nov. 8 for the machinery extension to the rebuilt electric power plant, which will consist of one 150-kv-a. generator, one 120-kv-a. generator, one electric switchboard, etc. Address T. W. Newell.

Brookings, S. D.—Bids will be received Nov. 10 for one brick power-plant building, one heating tunnel 902 ft. long, one reinforced concrete stack, one steel breeching, one 300-h.p. boiler, etc. Address T. W. Wright, president of State College of Agriculture and Mechanical Arts, Brookings, S. D.

INCORPORATIONS.

Rock Island, Ill.—H. E. Gelhart & Co., 2030 Seventh avenue. Capital, $50,000. To manufacture electrical supplies and fixtures. Incorporators: H. E. Gelhart, Willard E. Hartman and Clara Gelhart.

Danvers, Mass.—Atlantic Electric Lamp Co. Capital, $15,000. To manufacture electric lamps. V. A. Trotter is president, and William W. Trotter, Danvers, treasurer.

New York, N. Y.—Calodial Co. Capital, $50,000. To manufacture electrical measuring instruments. Incorporators: R. P. Nichols, A. W. Newberry and A. F. Upson, 30 Church street.

Monroe, N. Y.—O. & R. Electrical Supply Co. Capital, $100,000. To manufacture and deal in electrical equipment. Incorporators: R. W. Smith, A. J. Crane and F. Durland. The company is represented by E. C. Smith, Newburgh, N. Y.

Brooklyn, N. Y.—Standard Boiler Manufacturing Co. Capital, $100,000. To manufacture boilers and other power equipment. Incorporators: I. J. Dukore, N. Cooper and P. Kaplan. The company is represented by Samuel Rabinowitz, 149 Broadway, New York City.

Newark, N. J.—National Light & Electrical Co. Capital, $100,000. To manufacture and deal in electrical supplies. Incorporators: George Allendorf, Albert R. Hemmerslag and Harry Hirsch.

New York, N. Y.—National Generator Co. Capital, $500,000. To manufacture electrical machinery. Incorporators: W. W. Harris, W. C. Swift and W. J. Bloch, 317 East 18th street.

Jersey City, N. J.—Dalite Lamp Co. Capital, $50,000. To manufacture electric lamps. Incorporators: A. and E. Carell, and Warren Dixon, 665 Newark avenue.

Wilmington, Del.—Holt Power-Light Co. Capital, $2,000,000. To manufacture isolated power plants for rural service. Incorporators: M. L. Rogers, L. R. Wilson and M. N. Nichols. The company is represented by the Delaware Registration Trust Co., 900 Market street, Wilmington.

Baltimore, Md.—Hughes Engineering & Construction Co., 316 West Redwood street. Capital, $10,000. To manufacture electrical and mechanical equipment. Incorporators: Charles C. Sweglar, Charles Gunther and Theodore J. Robinson.

Chicago, Ill.—R. A. Crothwaite Co., 140 South Dearborn street. Capital, $10,000. To operate an electrical construction business. Incorporators: P. S. Davies, Henry Haltenhof and R. A. Crothwaite.

Chicago, Ill.—Central Armature Works, Inc., 417 South Racine avenue. Capital, $15,000. To operate an electrical contracting and repair business. Incorporators: Arnold I. Steen, Fred O. Erickson and Sidney E. Steen.

Philadelphia, Pa.—Seville Electric Co. has been organized by John A. Seville, Frank B. Haag and Samuel M. Brown, to operate an electrical contracting business. Francis G. Gallagher, Philadelphia, represents the company.

Pittsburgh, Pa.—Marvel Lamp Co. Capital, $50,000. To manufacture electric lamps. Incorporators: C. V. Brown, John S. Wallace and H. Nickum. The company is represented by the Capital Trust Co., Dover, Del.

Evansville, Ind.—Evansville Electric Service, Inc. Capital, $10,000. To manufacture electrical equipment. Incorporators: Charles Legeman, Sr., Clyde E. Zapp and Charles E. Kiefer, Evansville.

Newark, N. J.—Premier Miniature Bulb Co., 68 Warren street, has filed notice of organization to manufacture and deal in electric lamps. The company is headed by Angelo Paione, 695 Ridge street.

Newark, N. J.—Lighting & Electric Co., 613 Springfield avenue, has filed notice of organization to manufacture and deal in electrical specialties. Max Sternbach, 49 South Sixth street, heads the company.

Chicago, Ill.—Colonial Lamp & Fixture Works, Inc., 5634 Lake Park avenue. Capital $50,000. To manufacture and deal in electric lamps, fixtures, etc. Incorporators: Leon Hornstein, Eugene H. Joseph and Albert Hornstein.

New York, N. Y.—Guaranteed Battery Manufacturing Co. Capital, $150,000. To manufacture electric batteries. Incorporators: D. Smith, P. Probst and Sidney Nordlinger, 489 Fifth avenue.

Brooklyn, N. Y.—Economy Electrical Supply Co. Capital, $10,000. To manufacture electrical equipment. Incorporators: C. A. Carlson, C. A. Loscalzo and C. Kearney. The company is represented by I. Konigsberg, 114 Liberty street.

Greensburg, Ind.—Lee Bird Electric Service, Inc. Capital, $10,000. Incorporators: Lee Bird, Frank Hamilton and Carl Mendenhall.

Davenport, Ia.—Thermos Manufacturing Co. Capital, $25,000. To manufacture spark plugs. Martin Silberstein, president.

West Unity, O.—Unity Electric Co. Capital, $100,000. Incorporators: Charles F. Chapman, Frank M. Cobourn and others.

Laurel, Ia.—Haverhill-Laurel Electric Co. Capital, $50,000. Address Peter Neuroth, president, Haverhill, Ia.

Lemington, Wis.—Meteor Mutual Telephone Co. Capital, $6000. Incorporators: Fred Beyreis, Bert Zettle and Dave Senesac.

LaPorte, Ind.—Cruzen Manufacturing Co. Capital, $50,000. To manufacture heating plants. Directors: A. G. Tamlin, A. J. Rumely, V. J. McDonnell, H. J. MacDonald and R. E. Cruzen.

FOREIGN TRADE.

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Appliances (136)—A commercial agent in the United States who has trade connections with firms in Mexico desires to secure an agency from manufacturers for the sale of electrical appliances. References.

Street Lamps (150)—An inquiry has been received from a business man in Canada for the purchase of serviceable street-lighting lamps and gas street-lighting appliances. No reference offered.

FINANCIAL NEWS

Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks

Offering of Ohio Public Service Co. Gold Bonds.

Halsey, Stuart & Co., Chicago, is offering an issue of 5,100,000 Ohio Public Service Co. first mortgage and refunding 20-yr. 7.5% gold bonds, series "A," uncallable during the first 10 yrs., at 97.25% and accrued interest, to yield over 7.75%.

The Ohio Public Service Co., located in one of the most active industrial regions of the United States, was recently incorporated under the laws of Ohio for the purpose of combining and connecting with high-tension transmission lines several public service properties in that state. The constituent companies have been under the same management for a number of years and the experienced public utility men who are responsible for the growth of these companies will continue to operate the properties. The company supplies electricity for light, heat and power purposes, without competition, to Warren, Alliance, Massillon, Elyria, Lorain and other communities in Ohio.

Earnings Report of American Telephone & Telegraph Co.

H. B. Thayer, president, American Telephone & Telegraph Co., New York City, in his report, dated Oct. 15, to the stockholders of the company, stated:

"The business of the Bell System as a whole continues to show a healthy growth in spite of the fact that business in general has been comparatively quiet. There has been no abatement in the receipt of requests for telephone service, and notwithstanding the installation of new telephones at more than the normal rate, unfilled applications for service are still largely in excess of the normal amount. The net earnings of the Bell System show substantial improvement over last year.

"The company on May 10, 1921, offered to its stockholders of record on May 20, 1921, shares of new stock for cash at par. Subscriptions amounting to $83,775,000 were received under this offer, thus putting the company in funds for profitable investment in extensions to the business. It will be noted from the statement below that the earnings of the American Telephone & Telegraph Co., which do not include the company's interest in the undivided earnings of the Associated Companies, show an increase for 9 mo. of this year over the same months last year of $1,600,000 in the amount available for dividends. Approximately $4,000,000 more have been disbursed in dividends through the increased dividend rate and upon the larger capital, leaving undivided earnings for the period of more than $10,000,000."

	9 Mo. Ending Sept. 30, 1920.	9 Mo. Ending Sept. 30, 1921.*
Earnings:		
Dividends	$26,079,475.82	$28,345,757.01
Interest	9,369,580.35	10,056,913.46
Telephone operating revenues	41,788,954.53	43,002,227.88
Miscellaneous Revenues	127,795.83	69,709.76
Total	77,365,806.53	81,474,608.11
Expenses, including provision for Federal and other taxes	24,056,229.35	25,921,776.13
Net earnings	53,309,577.18	55,552,831.98
Deduct interest	14,150,855.74	14,765,219.97
Balance	39,158,721.44	40,787,612.01
Deduct dividends	26,527,290.66	†30,496,479.21
Balance	12,631,430.78	10,291,132.80

*Subject to minor changes when final figures for September are available.

†Includes dividends at 9% for second and third quarters.

North American Light & Power Co.

Earnings for the 12 mo. ended Aug. 31, 1921, with comparisons with corresponding period of 1920 are as follows:

	1921.	1920.
Gross	$3,404,011	$2,494,547
Net after taxes	880,301	681,271
Surplus after charges	355,253	129,151
Balance after preferred dividends	248,596	73,743

Fort Worth Power & Light Co.

	1921.	1920.
August gross	$ 209,777	$ 253,681
Net after taxes	95,224	71,833
Total income	95,504	72,672
Surplus after charges	78,718	56,110
12 mo. gross	2,821,956	2,083,822
Net after taxes	1,139,937	956,454
Total income	1,143,550	966,046
Surplus after charges	943,725	792,508
Balance after preferred dividends	839,612	692,912

Detroit Edison Co.

The consolidated balance sheet of the Detroit Edison Co. as of Aug. 31, 1921, shows as follows: Assets: Real estate, plant and equipment, $83,756,766; cash, $2,104,148; notes receivable, $31,710; accounts receivable, $3,164,534; materials and supplies, $4,395,409; prepaid accounts, $763,109; investments and special advances, $3,930,867; other assets, $101,900; debt discount and expense, $5,209,595; deferred accounts, $235,926; total, $103,693,964. Liabilities: Capital stock, $27,970,200; funded debt, $64,341,300; notes payable and acceptances, $2,346,191; accounts payable, $1,415,266; accrued liabilities, $2,146,731; permanent and corporate reserves, $55,765; operating reserves, $3,316,291; profit and loss surplus, $2,102,220; total, $103,693,964.

Nebraska Power Co.

	1921.	1920.
August gross	$ 246,633	$ 224,382
Net after taxes	79,180	53,798
Total income	95,716	56,374
Surplus after charges	45,202	23,814
12 mo. gross	3,076,723	2,738,824
Net after taxes	923,926	907,802
Total income	1,018,421	981,507
Surplus after charges	516,941	593,712
Balance after preferred dividends	306,941	383,712

General Gas & Electric Co. and Subsidiaries.

Statement of operating income for month of August, 1921 and 1920:

	1921.	1920.
Operating revenue	$904,998.41	$985,177.89
Operating expenses, maintenance, taxes and rentals	678,078.10	797,644.08
Operating income	226,920.31	$187,533.81

Combined statement of income of the General Gas & Electric Co. and subsidiary companies for the 12 mo. ended Aug. 31, 1921:

Operating revenue	$11,659,889.30
Operating expenses, maintenance, taxes and rentals	8,829,570.91
Operating income	2,830,318.39
Other income	206,939.55
Total income	3,037,257.94
Deductions from income, including interest on funded debt and dividends on stocks held by public	2,002,162.57
Balance	1,035,095.37
Less: Proportion not available for dividends on account of terms of preferred stocks of subsidiary companies	290,950.01
Balance	744,145.36

Dividends.

	Term.	Rate.	Payable.
Am. W. W. & El., 1st pfd.	Q	1.75%	Nov. 15
Columbia G. & El.	Q	$1.50	Nov. 15
Conn. Ry. & Ltg., co.m.	Q	1½%	Nov. 15
Conn. Ry. & Ltg., pfd.	Q	1½%	Nov. 15
Cons. Utilities, pfd.	Q	1.5%	Nov. 1
Dallas Pr. & Lt., pfd.	Q	1.75%	Nov. 1
Ft. Worth Pr. & Lt., pfd.	Q	1.75%	Nov. 1
Havana E. R. L. & P., com.	SA	$3	Nov. 15
Havana E. R. L. & P., pfd.	SA	$3	Nov. 15
Montreal L. H. & P.	Q	2%	Nov. 15
Montreal L. H. & P. Cons.	Q	1.25%	Nov. 15
Pacific Pr. & Lt., pfd.	Q	1.75%	Nov. 1
Texas Pr. & Lt., pfd.	Q	1.75%	Nov. 1

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Oct. 17.	Bid Oct. 24.
Adirondack Electric Power of Glenns Falls, common	6	12	12
Adirondack Electric Power of Glenns Falls, preferred	6	79	80
American Gas & Electric of New York, common	..	101	103
American Gas & Electric of New York, preferred	6	41	41
American Light & Traction of New York, common	..	89	95
American Light & Traction of New York, preferred	6	79	80
American Power & Light of New York, common	4	62	63
American Power & Light of New York, preferred	6	73	73
American Public Utilities of Grand Rapids, common	..	9	9
American Public Utilities of Grand Rapids, preferred	..	17	16
American Telephone & Telegraph of New York	9	108	108
American Water Works & Elec. of New York, common	..	4	5
American Water Works & Elec. of New York, particip	7	11½	15
American Water Works & Elec. of New York, 1st preferred	..	52	60
Appalachian Power, common	..	4½	5
Appalachian Power, preferred	7	39	49
Cities Service of New York, common	+extra	183	180
Cities Service of New York, preferred	6	55	55
Commonwealth Edison of Chicago	8	110	110½
Comm. Power, Railway & Light of Jackson, common	..	8	8
Comm. Power, Railway & Light of Jackson, preferred	6	26	25
Federal Light & Traction of New York, common	..	8½	8
Federal Light & Traction of New York, preferred	..	56½	59
Northern States Power of Chicago, common	..	46	47
Northern States Power Chicago, preferred	ex.div.7	79	80
Pacific Gas & Electric of San Francisco, common	..	60	..
Public Service of Northern Illinois, Chicago, common	7	81	81
Public Service of Northern Illinois, Chicago, preferred	6	82	81
Standard Gas & Electric of Chicago, common	..	8	8
Standard Gas & Electric of Chicago, preferred	8	33¼	33
Tennessee Railway, Light & Power of Chattanooga, common	..	¾	¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	5
Western Power of San Francisco, common	..	29½	29
Western Union Telegraph of New York	..	83½	82
Industrials—			
General Electric of Schenectady	8	124½	128½
Westinghouse Electric & Mfg. of Pittsburgh, common	7	45	44